Automated Multi-item Analyzer

TMS-1024i

Service Manual

Version 1.30

TOKYO BOEKI LTD.

TOKYO BOEKI MEDICAL SYSTEM LTD.

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Chapter 1 System Configuration

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1 . SYSTEM CONFIGURATION

1.1. Over View

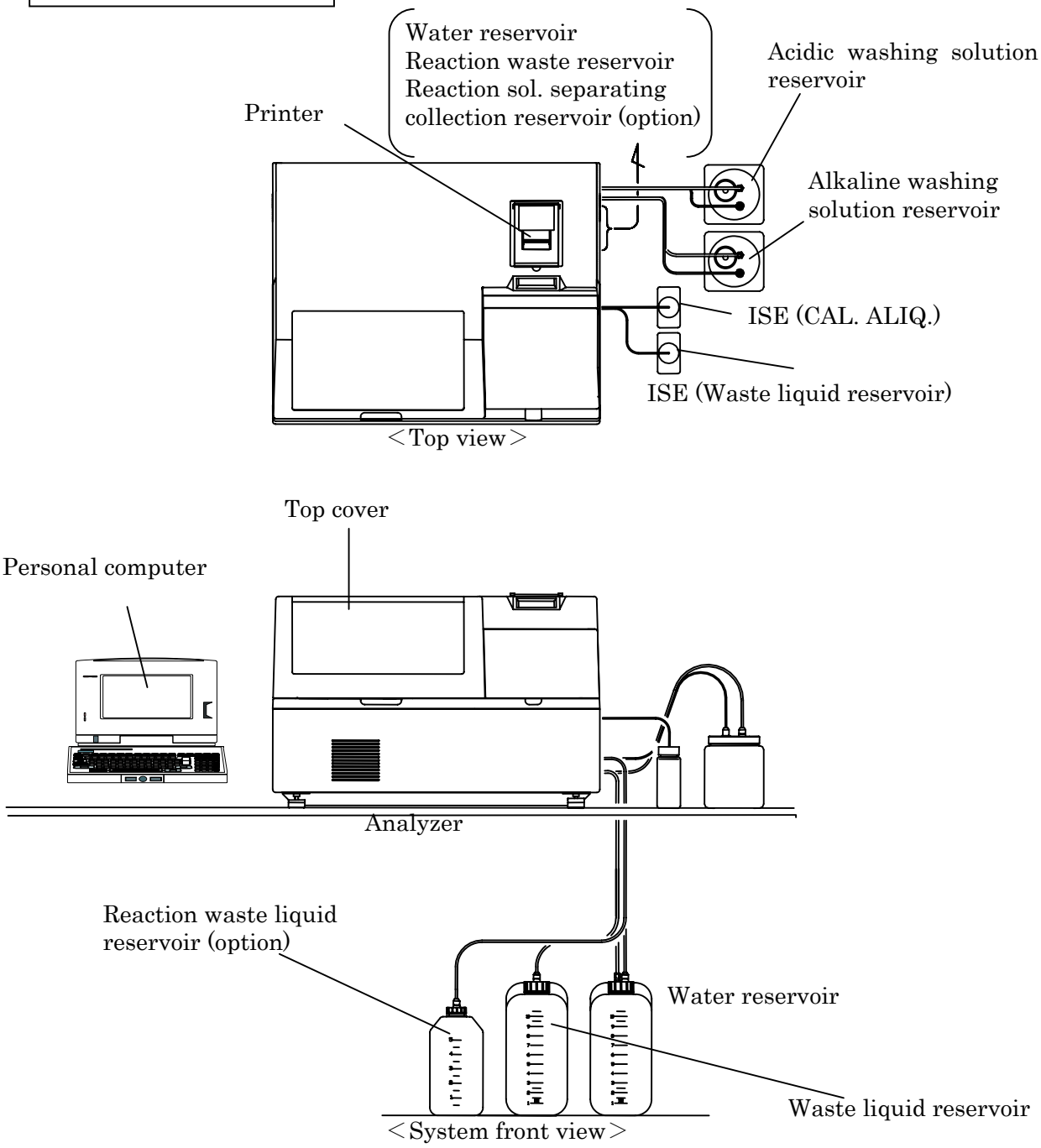

Fig. 1-1 Over view of the analyzer

1.2. Name of Each Unit

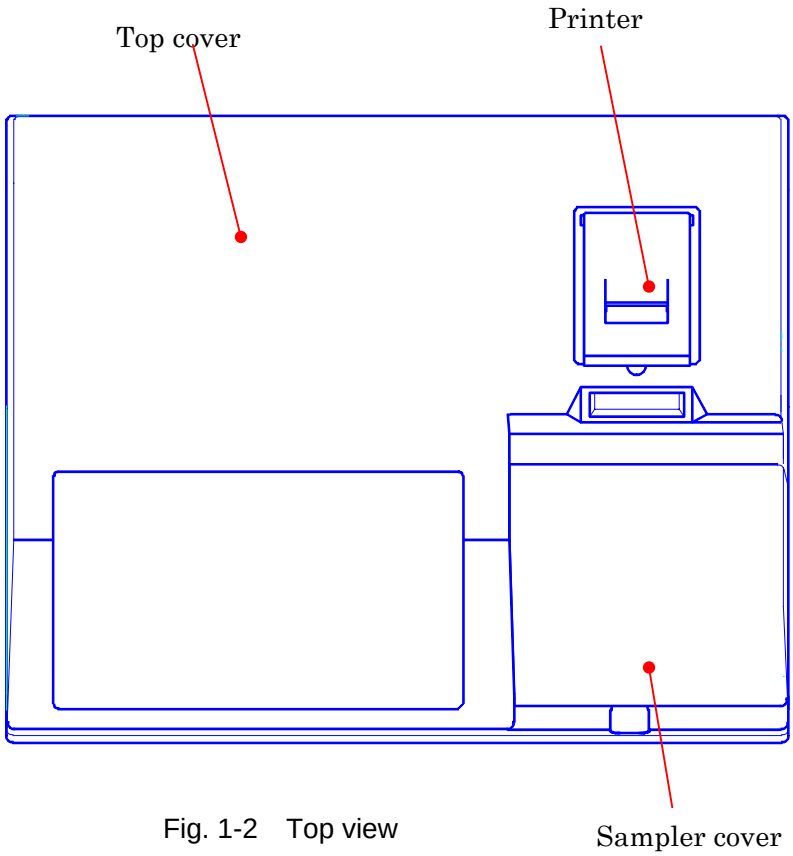

Fig. 1-2 Top view

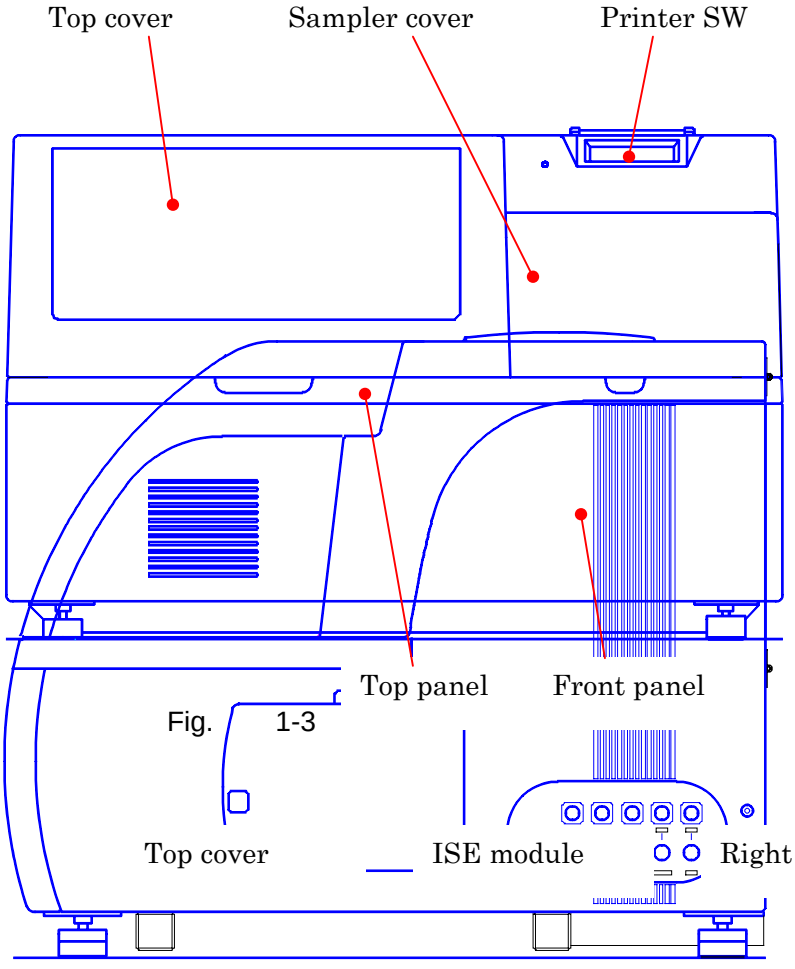

Fig. 1-3 Front view

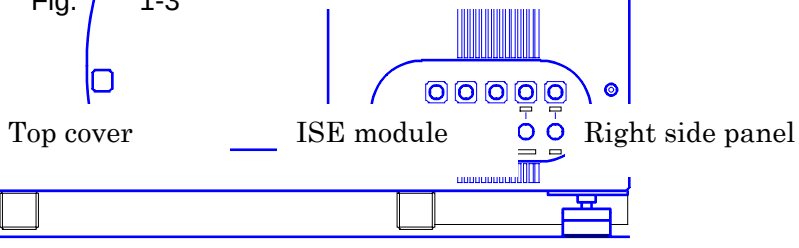

Fig. 1-4 Right side elevation of the analyzer

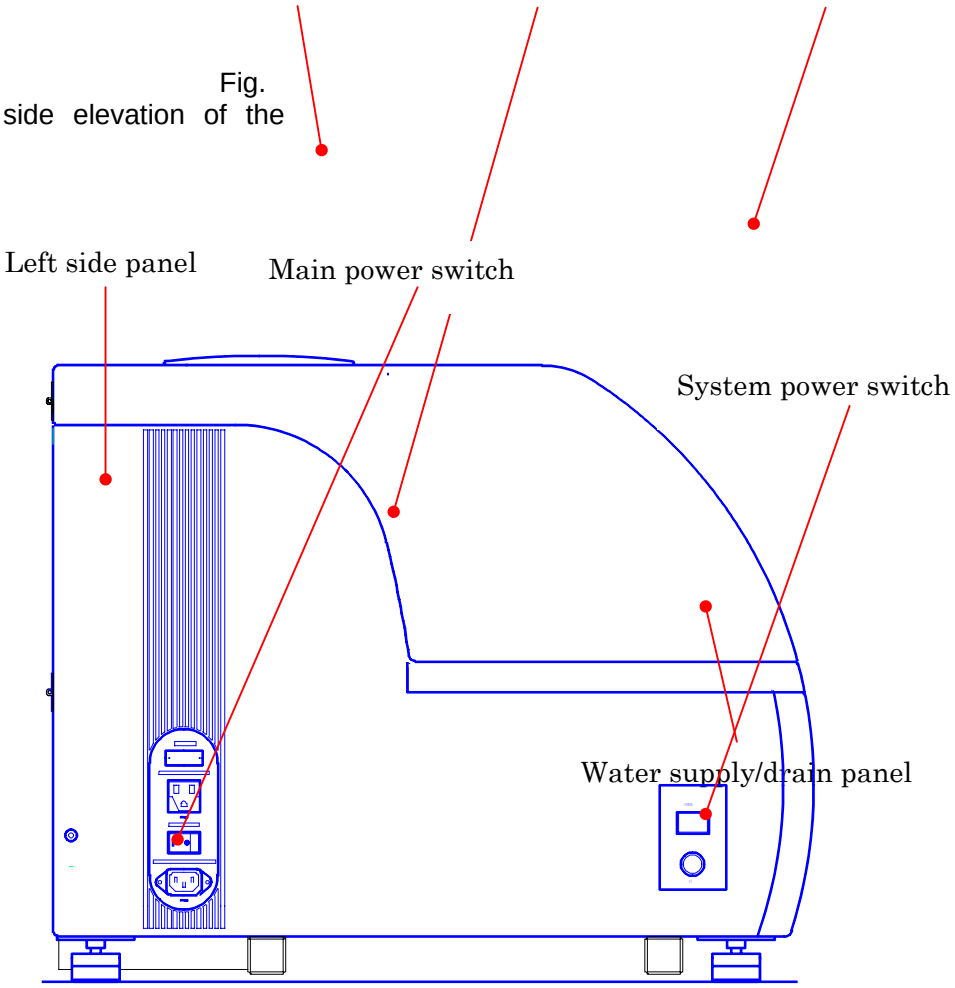

Fig. 1-5 Left side elevation of the analyzer

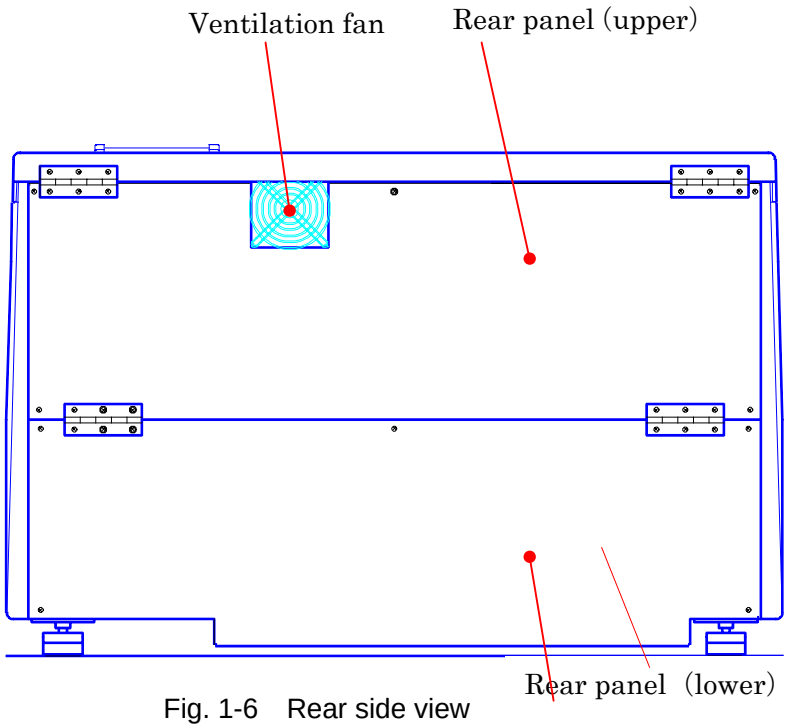

Fig. 1-6 Rear side view

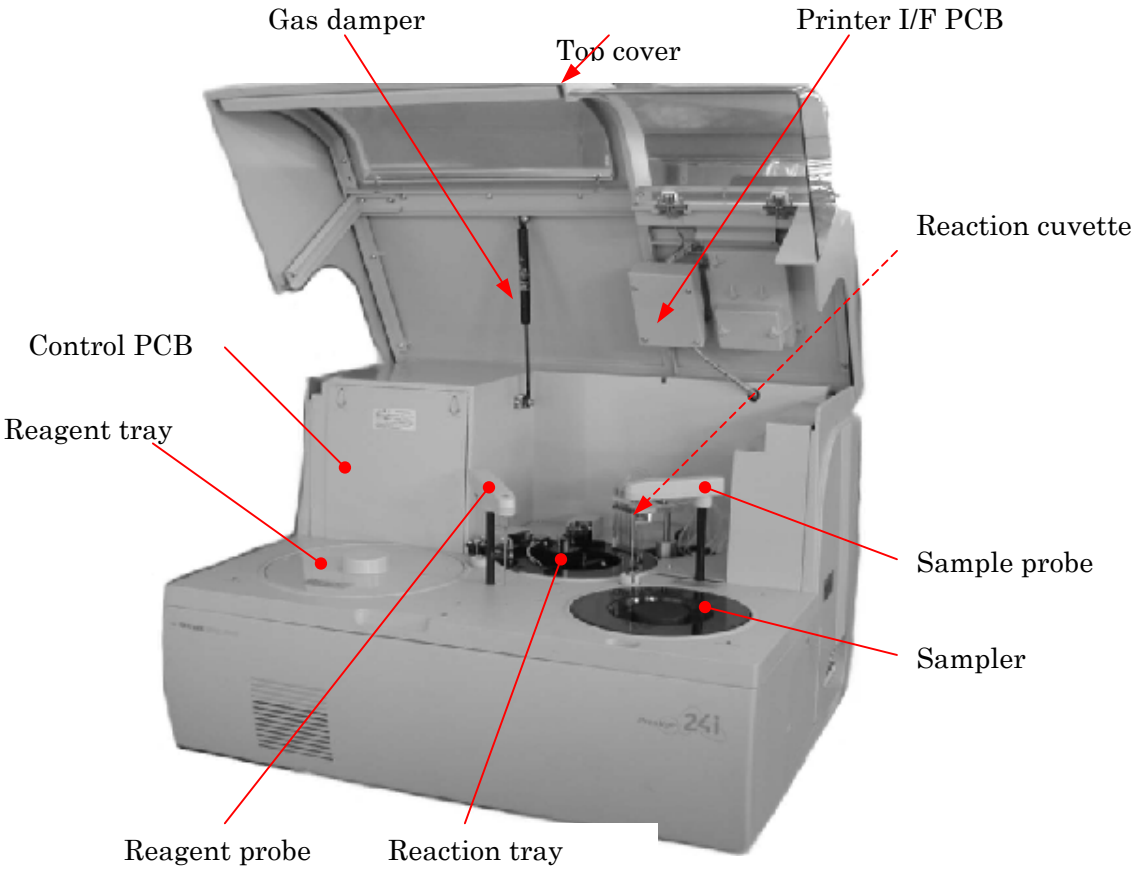

Fig. 1-7 The view when top cover is open

1.3. Panels

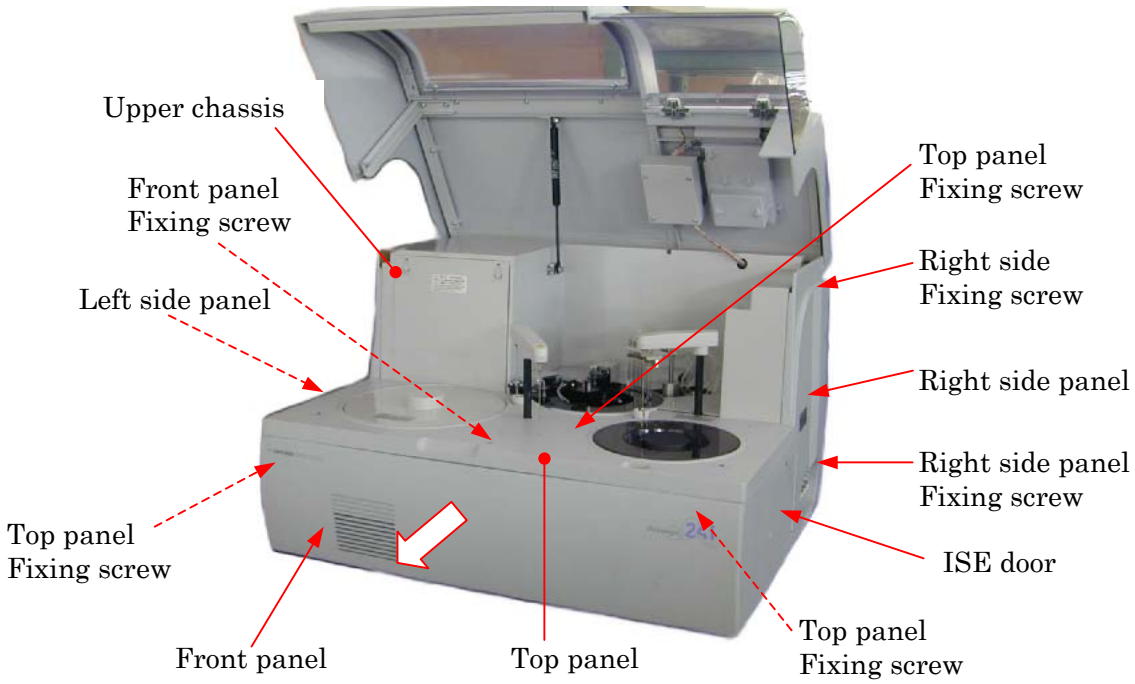

Fig. 1-8 System slant view

There are following nine panels.（Please refer to Fig. 1-6.）

1. Front panel
   It is fixed by one screw and four catches. When removing, loosen the screw and pull the panel towards you.

2. Top panel
   This panel is fixed by five screws. When removing, remove front panel first, and push over upper chassis after removing upper screws of right and left side panels.

3. Right side panel
   This panel is fixed by the upper and lower two screws and three catches.
   When removing, open top cover first and remove two screws to leave ISE door ajar.
   And loosen right screw of the reverse side of front panel.

4. Left side panel
   This panel is fixed by the upper and lower screws (two) and four catches.
   When removing, open top cover first to remove two screws. And loosen the right side screw of the reverse side of front panel.

5. Rear panel (upper)
   The upper panel in the back view. Fixed by nine screws. This panel has a fan.

6. Rear panel (lower)
   The lower panel in the back view. Fixed by ten screws.

1.4. Unit Layout

1.4.1. Unit layout in the front view

The drawing below shows front view when the front panel is removed.

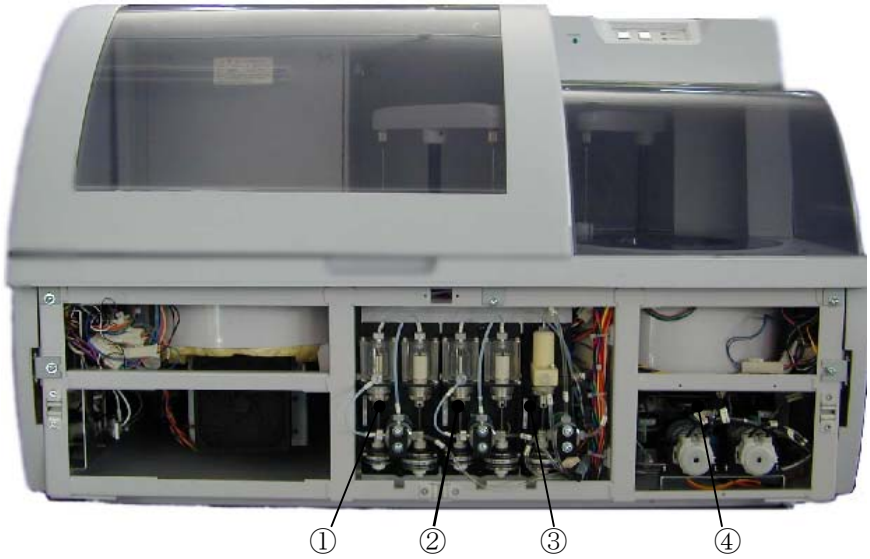

Fig. 1-9 Front view

① Reagent pump (RP)	Consists of a pump to aspirate/dispense reagent and a pump to wash the inside of reagent probe.
② Sample pump (SP)	Consists of a pump to aspirate/dispense sample and a pump to wash the inside of sample probe.
③ Probe washing pump	Washing water supply pump for the outside of reagent and sample probes.
④ ISE pump	Consists of a pump to pour calibrant into sample pot and a pump to pour sample or calibrant on to electrode and to drain.

1.4.2. Unit layout in the right side view

This drawing shows the right side view when the right side panel is removed.

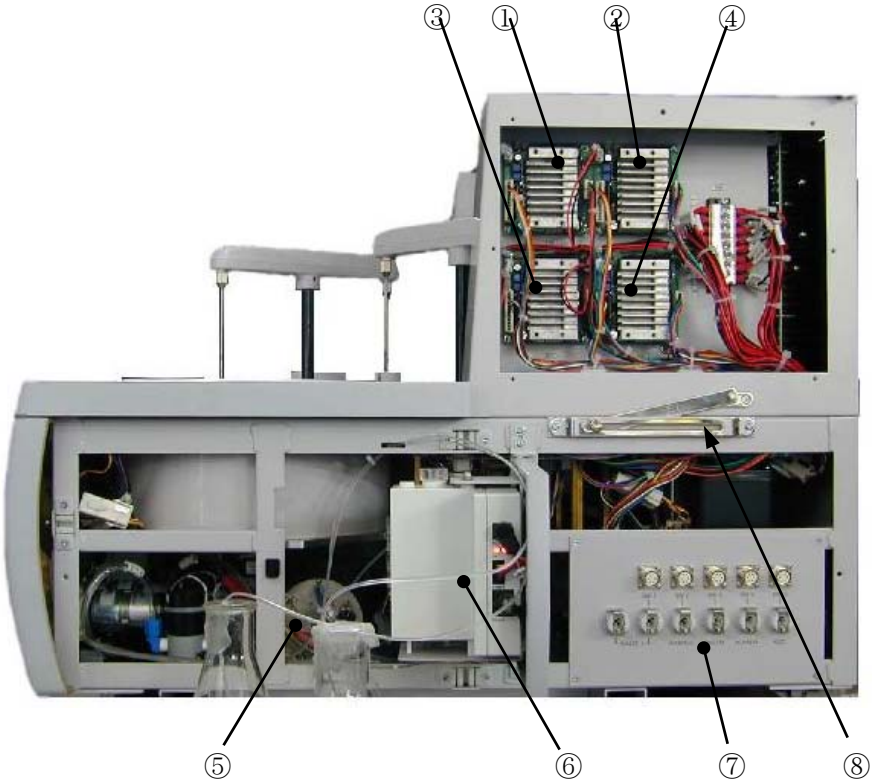

Fig. 1-10　Unit layout in the right side view

① Five-phase-motor driver	Stepping motor driver for RCT turn
② Five-phase-motor driver	Stepping motor driver for STM turn
③ Five -phase-motor driver	Stepping motor driver for RGT turn
④ Five -phase-motor driver	Stepping motor driver for RTM turn
⑤ Preheat (WSH)	Unit to preheat washing solution or detergent
⑥ ISE unit	Unit to measure electrolyte
⑦ Water supply and drainage panel	Panel for washing solution supply and drainage
⑧ Slide stay（right）	The supporting part when chassis is slanted.

1.4.3. Unit layout in the left side view

This drawing shows the left side view when the left side panel is removed.

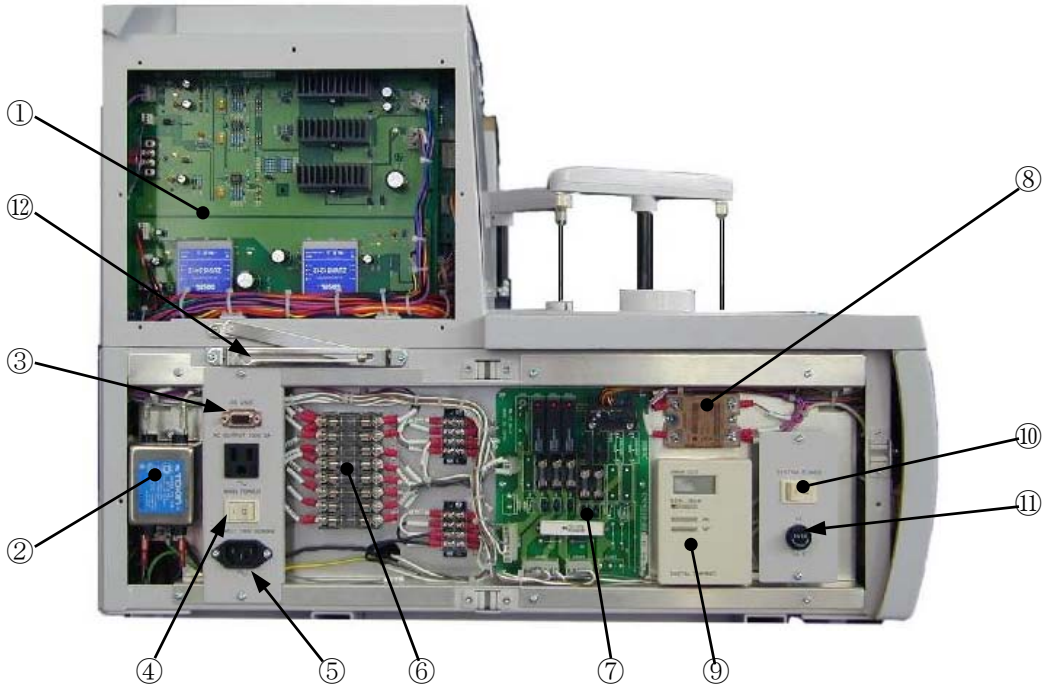

Fig. 1-11 Unit layout in the left side view

① Lamp DC PCB	PCB to supply power to light source lamp or others
② Noise filter	Filter to eliminate noise from power supply
③ RS-232C connector	Connector to personal computer (RS-232C)
④ Main power switch	When the switch on, cooling function is on.
⑤ AC power input	Plug for AC power
⑥ Fuse	Fuses from F2 to F9 are set.
⑦ SSR AC PCB	PCB to control the unit operated at AC 100V.
⑧ SSR	On-Off switch to control the temperature for reagent cooler.
⑨ Thermo module	Module to control the temperature for regent tray.
⑩ System power switch	When this switch on, the system is started automatically.
☐ Fuse	System fuse F1 (5A)
☐ Slide stay (left)	The supporting part when chassis is slanted.

1.4.4. Unit layout in the rear view

This drawing shows the rear view when the rear panel is removed.

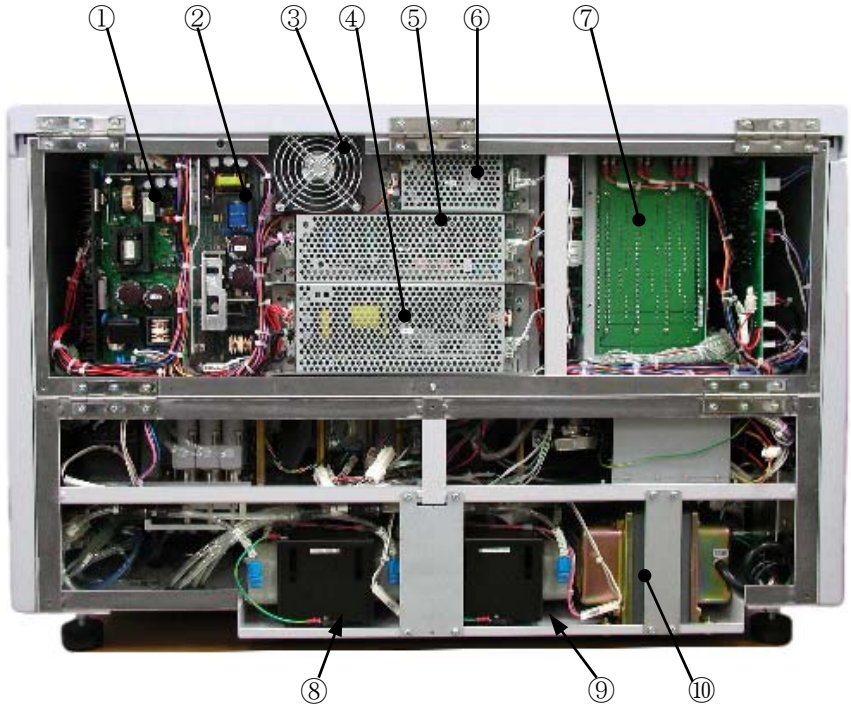

Fig. 1-12 Unit layout in the rear view

① DC±15V/ +5V power supply	ZT90-5FF type
② DC±12V power supply	LDA 100W-12 type
③ Ventilation fan	Fan to be operated at DC 12V
④ DC±24V power supply	LDA150W-24-SNY type
⑤ DC±15V power supply	LDA75F-15-SNY type
⑥ DC±5V power supply	LDA15F-5-SNY type
⑦ Mother board	Mother board PCB
⑧ DP-1	Pump to aspirate reaction cuvette washing solution and to degas from degasser.
⑨ DP-2	Pump for reaction waste liquid and washing trough waste water.
⑩ Power transformer	Input voltage (AC100V, 115V or 230V.) Output voltage (AC100V)

1.4.5. Unit layout of the first floor

This drawing shows unit location fixed to lower chassis.

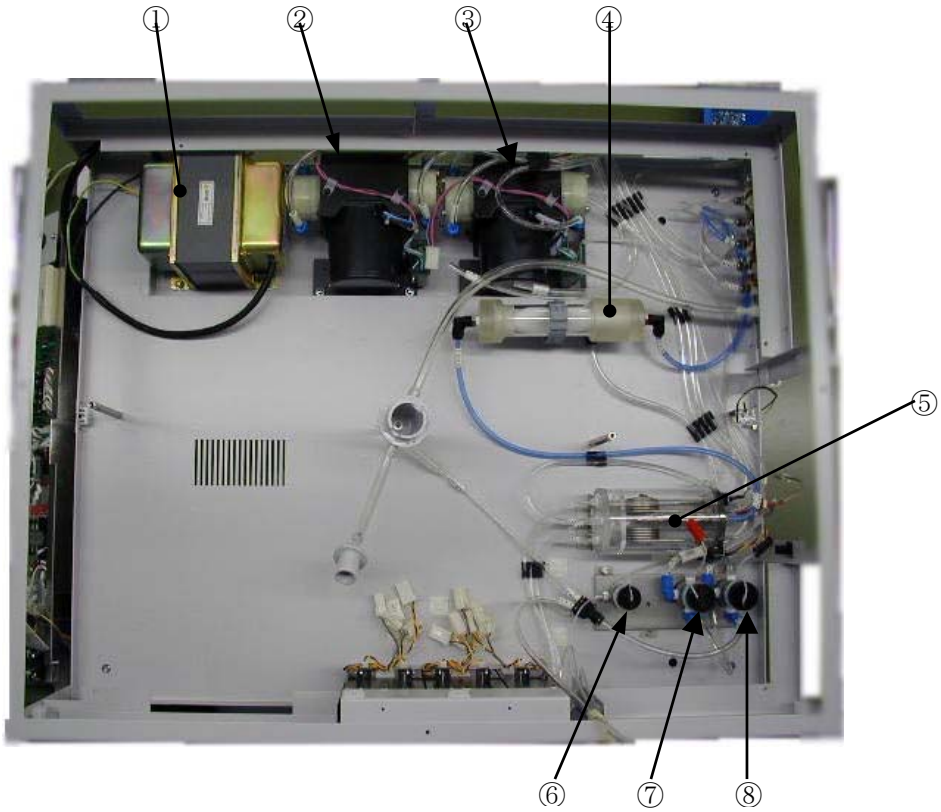

Fig. 1-13 Unit layout of the first floor

① Power transformer	Input voltage (AC100V, 115V or 230V.) Output voltage (AC100V)
② DP-2	Pump for reaction waste liquid and washing trough waste water.
③ DP-1	Pump to aspirate reaction cuvette washing solution and to degas from degasser.
④ Degasser	Module to remove air in washing water.
⑤ Washing solution pre-heater	Heater for reaction cuvette and probe washing solution and for alkaline and acidic washing solution.
⑥ Electromagnetic valve EV-3	Valve for switching piping lines of R1 and R2 probes.
⑦ Electromagnetic valve EV-5	Valve for switching aspiration lines of dry tips and degasser.
⑧ Electromagnetic valve EV-6	Valve for switching aspiration lines of WSH and washing trough.

1.4.6. Unit layout of the second floor

The drawing below shows the view when the upper chassis is slanted and the upper panel and the plate are removed.

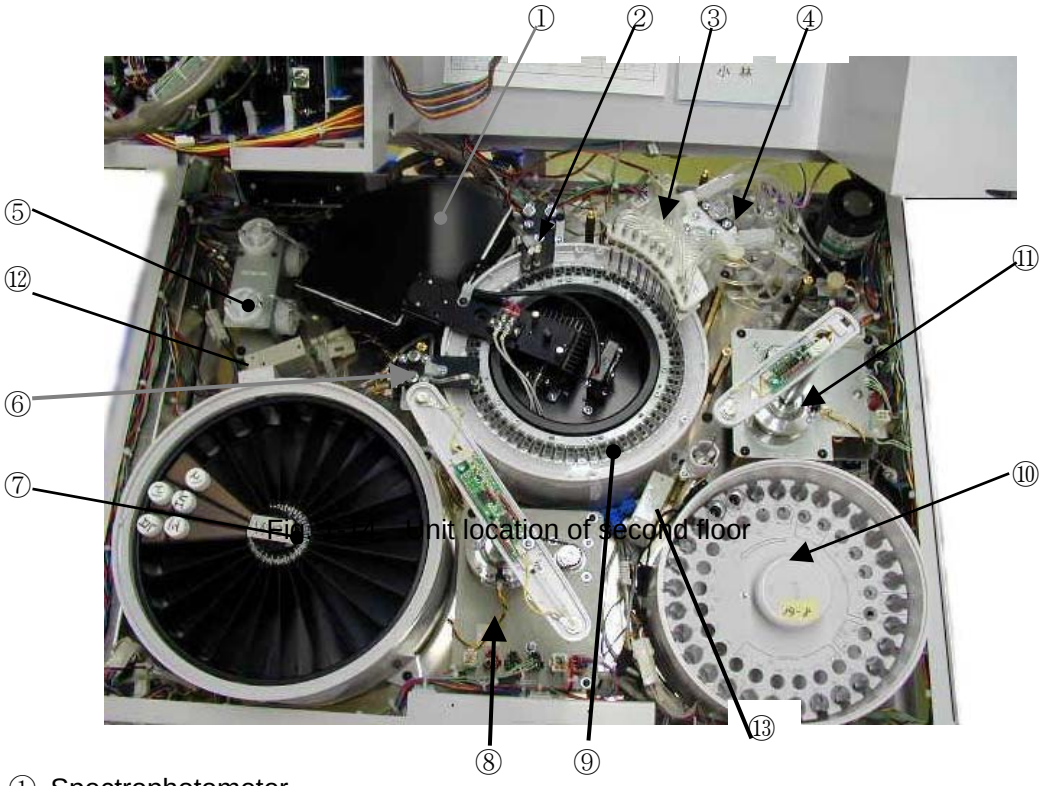

Figure 1.4.6 Unit location of second floor

① Spectrophotometer (SPM) — Unit to measure optical absorbance of reaction liquid.

② Mixing unit - 1 (MU-1) — Unit to handle sample and R1 mixing and R2 addition mixing.

③ Reaction cuvette washing mechanism(CWS) — Unit to wash reaction cuvette.

④ Reaction cuvette washing pump (CWP) — Pump to wash reaction cuvette.

⑤ Mixing pump (MP) — Unit to supply reciprocal air pressure for mixing.

⑥ Mixing unit-2 (MU-2) — Unit to re-mix before measurement.

⑦ Reagent tray (RGT) — Unit to rotate reagent bottles and keep them cool.

⑧ Reagent probe — Unit to dispense reagent R1 and R2 into reaction cuvettes.

⑨ Reaction tray — Unit to rotate reaction cuvettes and control the temperature.

⑩ Sampler (STF) — Unit to hold a sample tray and rotate with it.

☐ Sample probe (STM) — Unit to dispense sample into reaction cuvettes.

☐ Reagent barcode reader

☐ Sample barcode reader

1.4.7. Unit layout on the upper deck

The drawing below shows the control PCB attached to the front of system.

Fig. 1-15 Front view

Fig. 1-16 PCB box (enlarged)

① Lamp DC PCB	PCB to supply power to light source lamp and others.
② TCD PCB	Temperature control for reaction tray.
③ MCPU PCB	Control center of each PCB and PC communication.
④ UCN-1 PCB	PCB to control reaction tray and other units.
⑤ UCN-2 PCB	PCB to control reagent tray and other units.
⑥ SCPU PCB	PCB to transform light intensity data into AD and LOG.
⑦ PMDRV PCB	2-phase-stepping motor driver.

Chapter 2 Functions and Movement of System

This chapter explains functions, movement and dispensation principle of the system.

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2. FUNCTIONS AND MOVEMENT OF SYSTEM

2.1. Functions and Movement

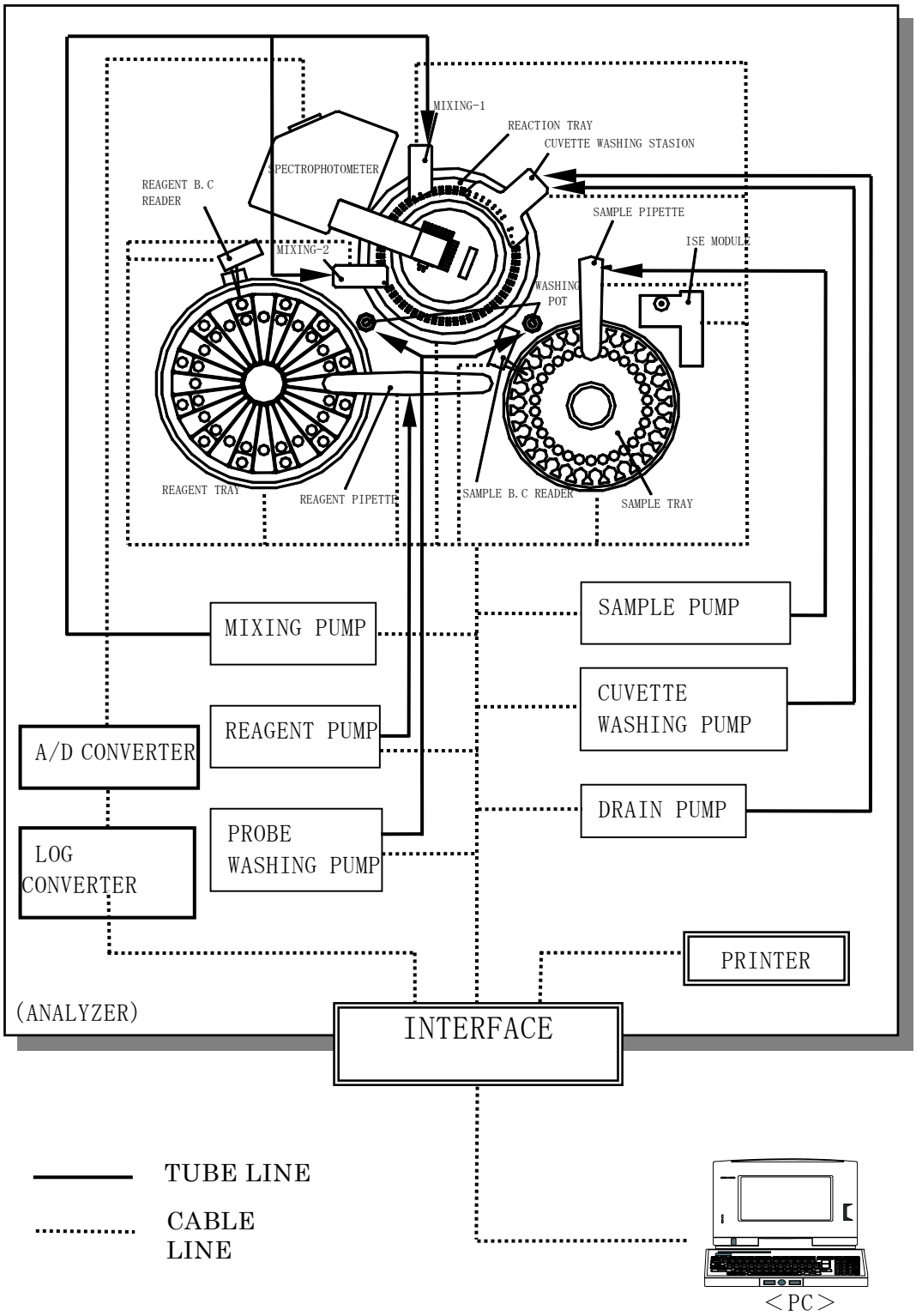
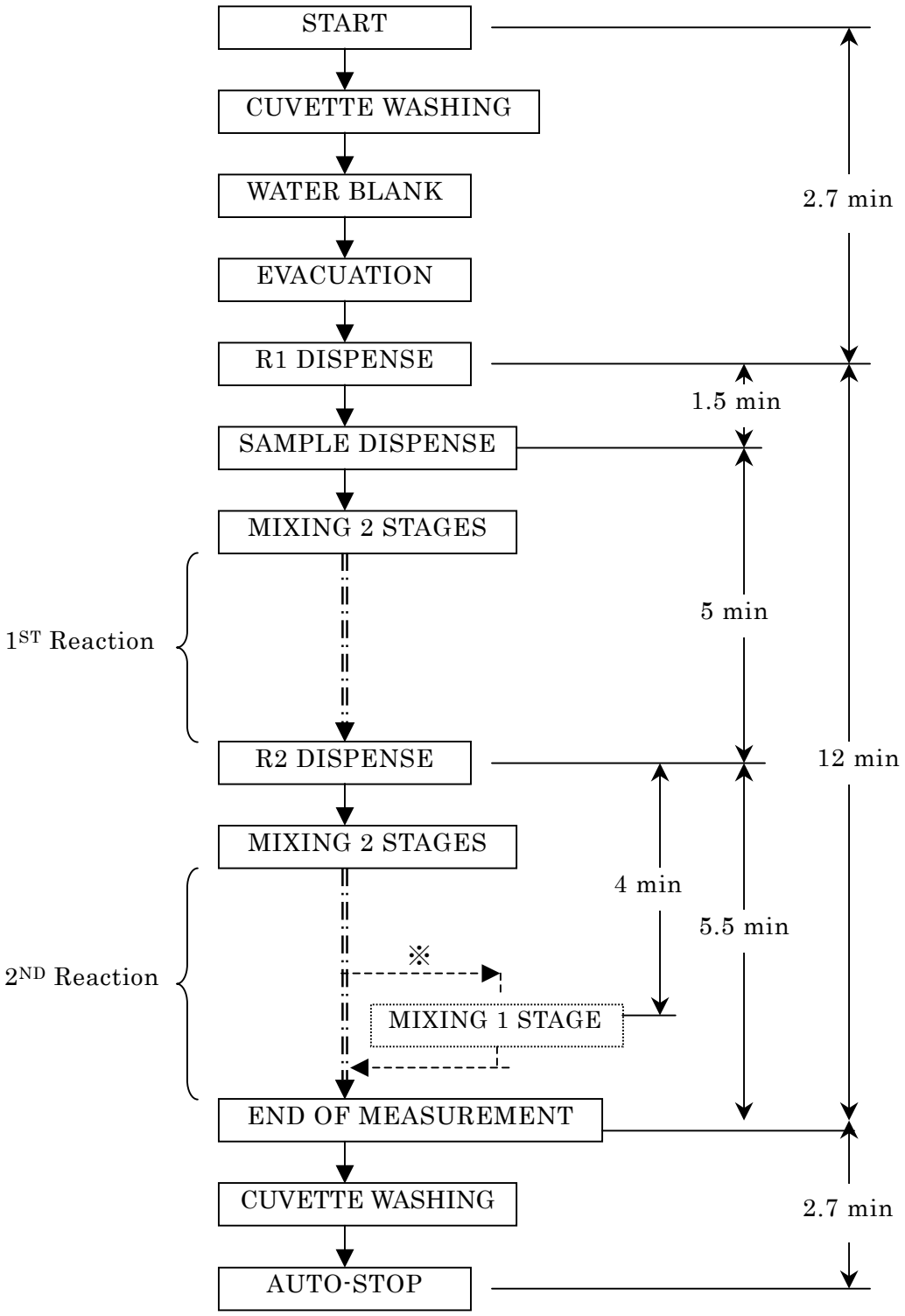


Fig. 2-1 Function diagram



※） This process is performed before the measurement by request.

Fig.2-2 Analysis flow diagram

2.2. Analysis Process and Optical Measurement Point

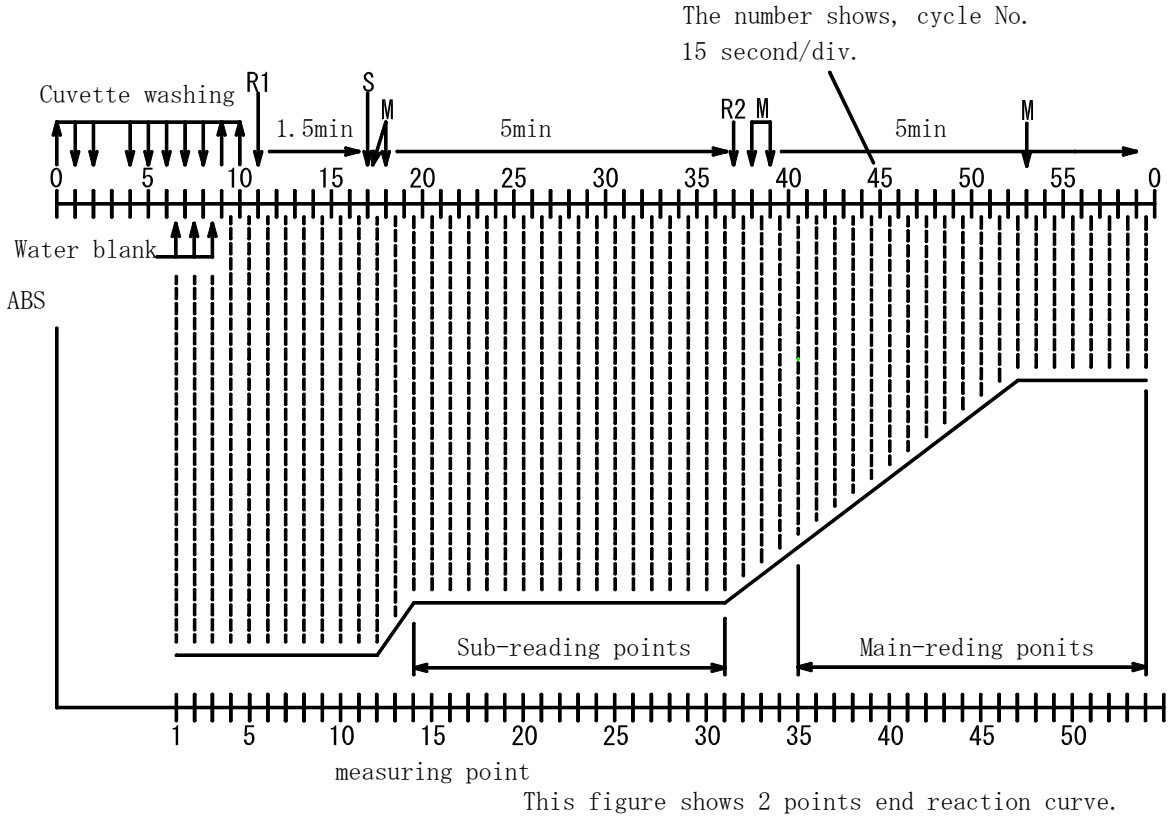


Fig.2-3 Analysis process diagram

＜Explanation＞

S : Sample dispense
R1 : R1 dispense
R2 : R2 dispense
M : mixing

＜Analysis process＞

Cycle after start	Function	Optical measurement
6, 7, 8	Water blank measurement	1, 2, 3
11	R1 dispense	6
17	Sample dispense	12
17, 18	Mixing (R1 + sample)	12, 13
37	R2 dispense	32
38, 39	Mixing (R2 + reaction liquid)	33, 34
53	Mixing before measurement	48
60	Reaction waste aspiration	55

※For 1 regent system only, there are no R2 dispense nor mixing.

2.3. Automatic Analysis Process

PRESTIGE 24i is composed of the following units. They are sampler, sample delivery, reagent tray, reagent delivery, reaction tray, mixing units, cuvette washing unit, spectrophotometer and so on.
The combined movements of mechanical units are explained here. Please refer to Fig. 2-33 Movement principle and Fig. 2-34 Flow diagram of analysis.

Sample cups/tubes with sample in it are set in the sample tray, and reagent bottles are set in the reagent tray.
Test orders for these samples are entered in Order Entry screen.

↓

When start button is clicked, cuvette washing unit starts washing from No.1 cuvette.

↓

Before the last step of cuvette washing, water blank is measured.
When reaction tray rotates and the cuvette passes the optical measurement position, light absorption data of 12 wavelengths are measured.
These data are the basis of optical absorption (Absorption = 0) to the following optical absorption measurement.
After the water blank measurement, de-ionized water is aspirated out and cuvette inside is wiped out.

↓

When No.1 cuvette advances to one step before the R1 dispense position, reagent tray rotates and transports the reagent bottle to the reagent aspiration position.
Next, R1 probe moves to the aspiration position, above the reagent bottle, then moves down to the reagent level.
＊) This probe has level sensing function and it stops when the probe tip touches the reagent. The designated amount of reagent is aspirated by reagent pump.

↓

Next, R1 probe goes up and moves to the R1 dispense position and waits for the cuvette coming to the dispense position.
When the cuvette comes to the position, R1 probe goes down to the designed level and dispenses the reagent. Then, R1 probe moves to probe washing pot and both inside and outside are washed by de-ionized water there.
After that, residual water droplets are wiped out.

↓

At the 5th cycle after the R1 dispense, sample tray rotates to transfer No.1 sample cup/tube to the sampling position. Sample probe moves above the sample cup then goes down.
＊) Sample probe also has level sensing function, and stops at the sample level. The designated amount of sample is aspirated by sample pump.

↓

Then sample probe moves above No.1 cuvette and goes down to the R1 reagent level in the cuvette, and dispenses sample. After the dispensing, probe goes up.

↓

At the next cycle, the cuvette is moved to the mixing station-1, where R1 and sample are mixed by MU-1, mixing unit.
This mixing is repeated in the next cycle, two times in total.

↓

Sample probe moves to probe washing pot and both inside and outside are washed by de-ionized water, there. After that, residual water droplets are wiped out.

↓

After the R1 and sample are mixed, optical measurement starts. When reaction tray rotates and the cuvette passes the optical measurement position, light absorption data of 12 wavelengths are measured.

↓

After 5 minutes of R1 dispense, the cuvette moves to R2 dispense position, the same position as R1 dispense, then R2 is dispensed by R2 probe, which has same function as R1 probe. After the dispensing, R2 probe goes up.

↓

At the next cycle, the cuvette is moved to the mixing station-1, where R2 and reaction liquid are mixed by MU-1.
This mixing is repeated in the next cycle, two times in total.

↓

R2 probe moves to probe washing pot and both inside and outside are washed by de-ionized water. After that, residual water droplets are removed.

↓

After 4 minutes of R2 dispense, the cuvette comes to the mixing station-2, where the particles in reaction liquid are dispersed again by MU-2. (Mixing before the measurement is done by request.)

↓

After 10.7 minutes of sample dispense, reaction liquid in the cuvette is aspirated out by the No.1 nozzle of the cuvette washing unit and transferred to the waste reservoir, outside of the analyzer.

↓

As the last step of the measurement, for the 1st test of No. 1 sample, optical absorption data are converted to concentration/activity data using calibration curve. But test results will not be printed out till whole test results of No.1 sample are obtained.

The same process is repeated for the 2nd, 3rd… test items, and the 2nd, 3rd… sample.

2.4. Reagent Dispensation Process

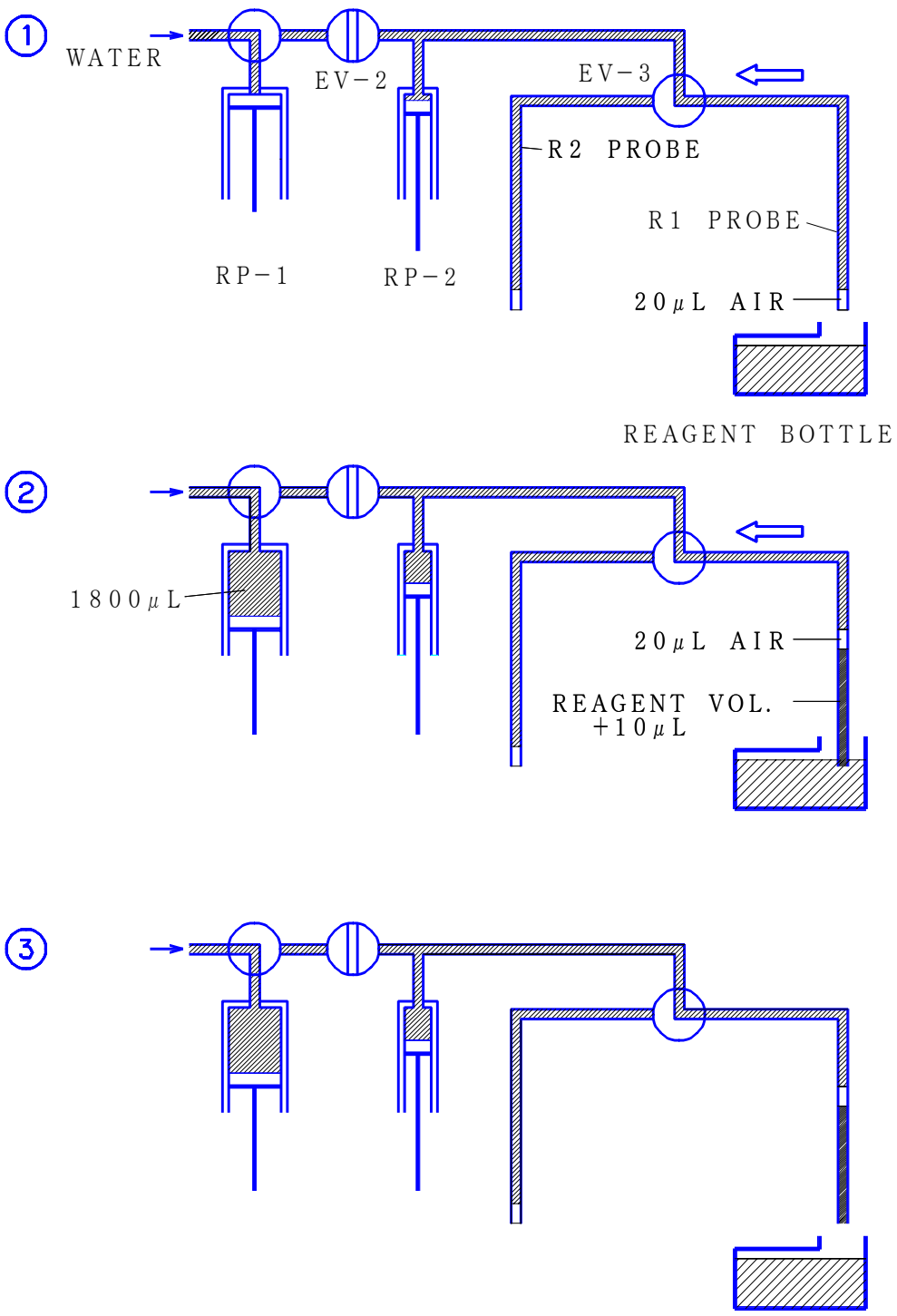


Fig. 2-4 Reagent dispensation process (1/2)

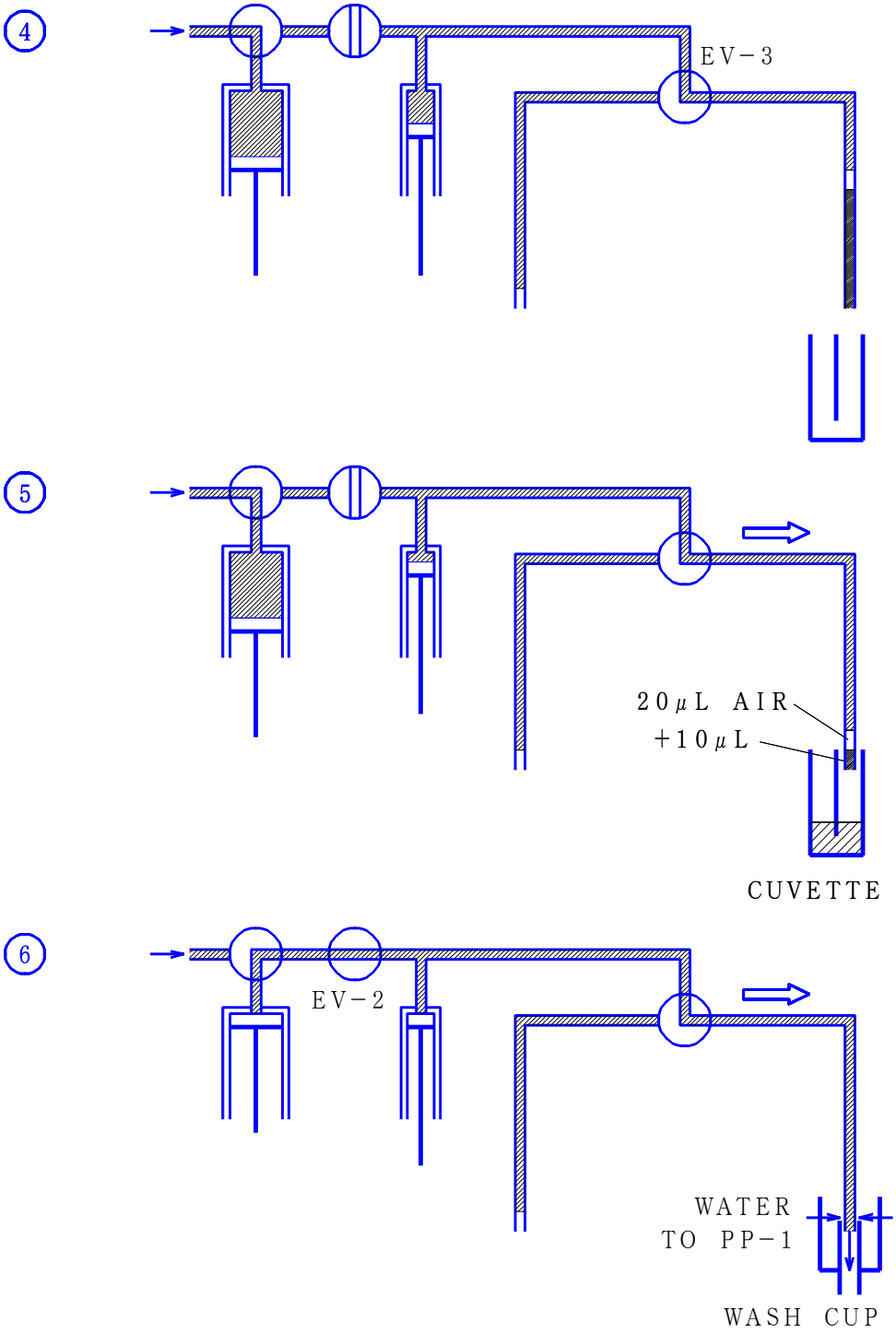


Fig. 2-5 Reagent dispensation process (2/2)

① When R1 probe moves to above the reagent bottle, 20 μ L separation air is aspirated by the action of reagent pump (RP-2).

② R1 probe goes down till the tip detects the reagent level. Then RP-2 aspirates 10 μ L excess reagent volume than designated.

③ R1 probe goes up to the home position.

④ R1 probe rotates to the reaction cuvette position.

⑤ When R1 probe goes down into a cuvette and stops at the determined position, designated volume of reagent is dispensed.

⑥ R1 probe once goes up to the home position and reaction tray rotates to the next position. Then goes down again and stops. R2 probe, which is in the probe washing pot, will be washed, following the procedure below.

- Solenoid valve EV-3 switches the line to R2 side and solenoid valve EV-2 will be ON, which connects to probe washing pump.
- RP-2 dispenses excess 10 μ L reagent and separation air 20 μ L into the washing pot.
- Probe washing pump (PWP) are actuated and RP-1 sends solution to wash probe inside and PWP washes outside.

R1 probe washing is down within the same cycle as R2 washing.

R1 is washed right after the R2 probe reagent dispense.

The procedure of R1 washing is the same as R2 washing except R1 probe is in the washing pot and solenoid valve EV-3 is switched to the R1 side.

⑦ After the probe washing, water droplet at the tip is wiped up by a wiping mechanism at the top of the washing pot when the probe goes down.

2.5. Sample Dispensation Process

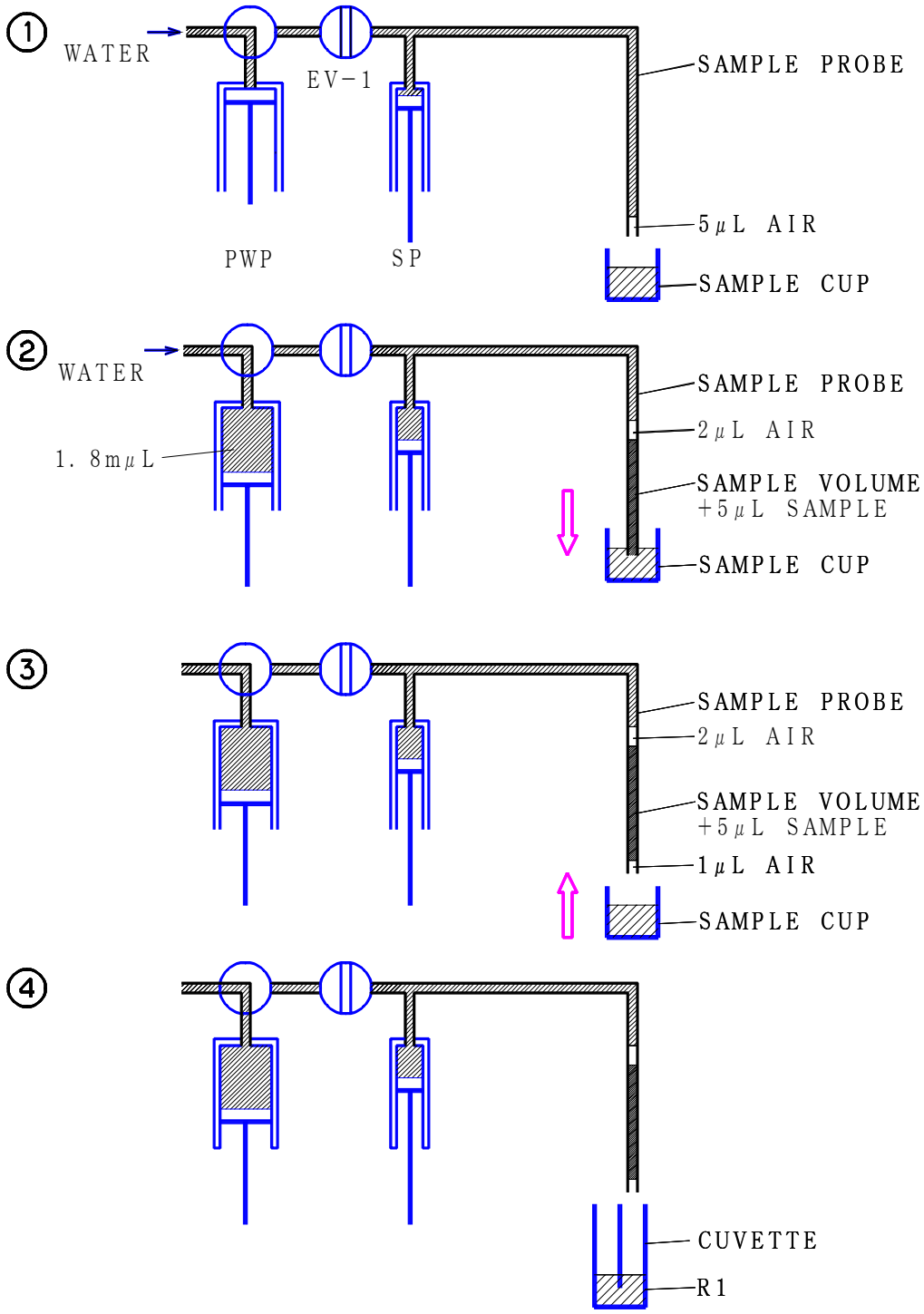


Fig. 2-6 Sample dispensation process (1/2)

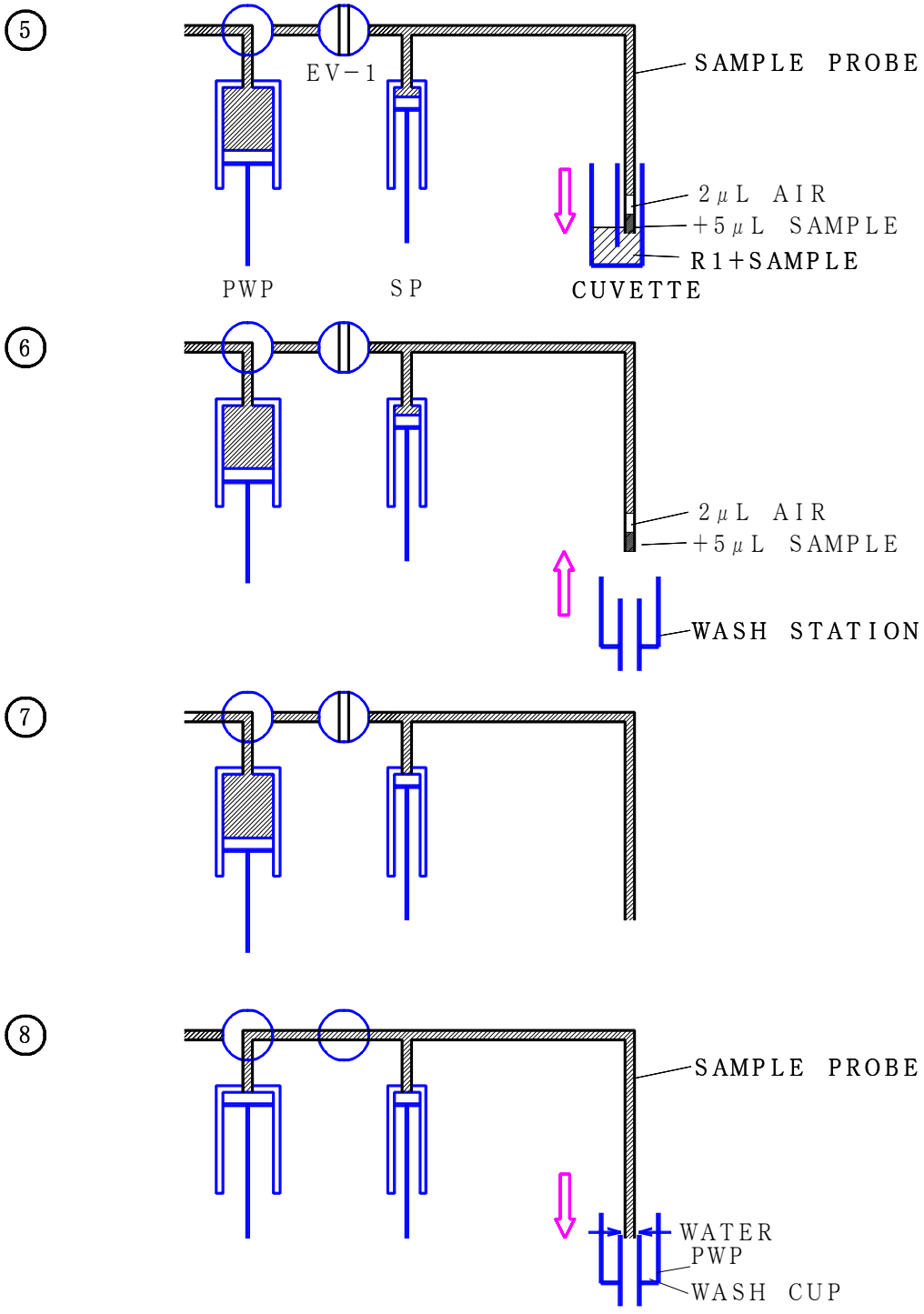


Fig. 2-7　Sample dispensation process (2/2)

① When sample probe (S-probe) moves to above a sample cup, 2 μ L separation air is aspirated by the action of sample pump (SP-2).

② S-probe goes down till the tip detects the sample level. Then SP-2 aspirates 5 μ L excess sample volume than designated.

③ S-probe goes up to the home position. While the movement, another 1 μ L air is aspirated by SP-2.

④ S-probe rotates to the reaction cuvette position.

⑤ When S-probe goes down into a cuvette and touches reagent, it stops and designated volume of sample is dispensed by SP-2.

⑥ S-probe goes up to the home position and moves to above the washing pot.

⑦ S-probe goes down into the washing pot and stops. Then SP-2 dispenses excess 5 μ L sample and separation air 1 μ L into the washing pot.

⑧ Solenoid valve EV-1 is actuated and connects probe washing pump (SP-1) to S-probe.
SP-1 and PWP are actuated and SP-1 washes S-probe inside and PWP washes outside.

⑨ After the probe washing, water droplet at the tip is wiped up by a wiping mechanism at the top of the washing pot when the probe goes down.

Chapter 3 Explanations about Units

This chapter explains function, action and removal of each unit.

● Contents

3. 1 Sampler (STF) ---------- 3-2
3. 2 Sample Pipette (STM) ---------- 3-6
3. 3 Sample Pump (SP) ---------- 3-11
3. 4 Reagent Tray (RGT)---------- 3-14
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3.1. Sampler (STF)

3.1.1. Parts and Configuration

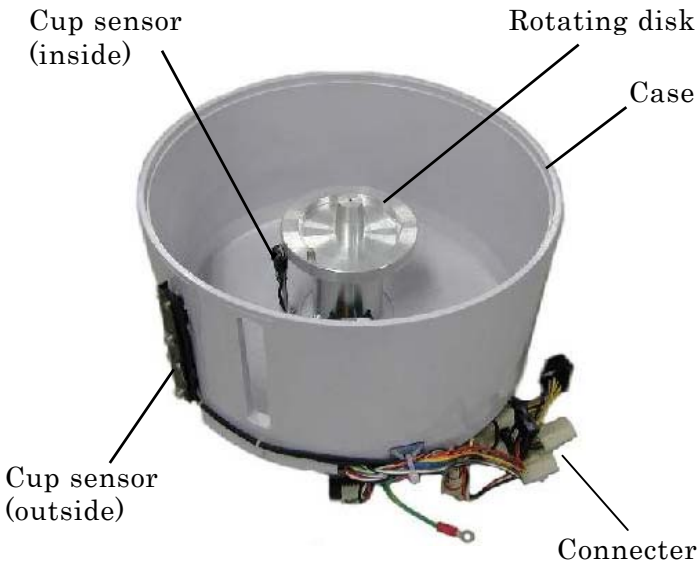


Fig. 3-1 Sampler plan and sectional drawing

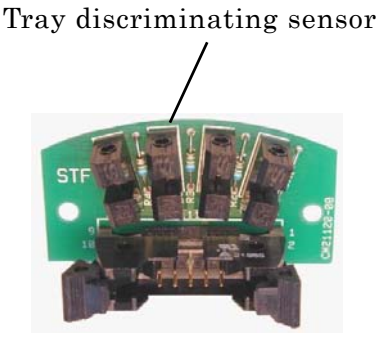


Fig. 3-2 STF PCB

- Refer to "ASSY-3 STF" for the assembling.
- Refer to "WIRING-6 STF" for the wiring.

3.1.2. Sample tray specifications

1. Sample trays and specifications

Fig. 3-3 Patient sample tray (white)

Fig. 3-4 Calibration tray (yellow)

1. Sample trays

· Patient tray (In case of NO. 1 tray)

(Outside)	Patient sample (1～30)	30 samples
(Inside)	Patient sample (31～40)	10 samples
	Control sample (C7～C12)	6 samples
	Washing (W1, W2)	2 samples
	STAT (E1～E5)	5 samples
	ISE standard liq. (CAL)	1 sample
	ISE washing liq. (WASH)	1 sample

· Patient tray (In case of NO. 2 tray)

(Outside)	Patient sample (41～70)	30 samples
(Inside)	Patient sample (71～80)	10 samples
	Control sample (C13～C18)	6 samples
	Washing (W1, W2)	2 samples
	STAT (E6～E10)	5 samples
	ISE standard liq. (CAL)	1 sample
	ISE washing liq. (WASH)	1 sample

2 patient trays (NO. 1 and NO. 2) are attached as standard accessories, and other 8 trays (NO. 3～NO. 10) can be supplied as option.

· Calibration tray

(Outside)	Blank (B1, B2)	2 samples
	Standard sample (S1～S28)	28 samples
(Inside)	Standard sample (S29～S46)	18 samples
	Control sample (C1～C6)	6 samples
	ISE standard liq. (CAL)	1 sample

2. Sample tray discrimination

· Sample tray has combination slit which corresponds to tray number.

· When a tray is set to a sampler, a sensor on the STF PCB detects this slit and recognizes tray kind and number.

3.1.3. Function and Operation

1. Function

   The sample tray holds cups with patient sample, standard sample or control sample in it. Then this tray is set to the sampler.

   When the tray is set to the sampler, the tray number will be read by the tray discriminating sensor (Fig. 3-2).

   There are two aspiration positions of sample probe; samples set on the outside of sample tray will be aspirated at A position, and samples set on the inside at B position.

2. Operation (Refer to Fig. ASSY-3.)

   Set sample tray, fitting the hole of sample tray into the guide pin of the rotating disk ③.

   When stepping motor ⑦ rotates, the rotation is transferred to the rotating disk ③ and the sample tray through the plane gear ⑤.

   The plane gear ⑤ has a shade pin, which shades the sensor ⑥ light at the initialization. This detects home position.

   When home position sensor detects home position, rotary encoder (united with the motor) is reset and output will be zero.

   During the measurement, sample tray rotates clockwise and carries sample cups to the aspiration position A (in case of the outside), or to the aspiration position B (in case of the inside) one by one.

   Rotary encoder counts motor rotation angle, and sample tray rotation angle is checked.

3.1.4. Unit Dismantling and Re-assembly

1. Unit dismantling

Fig. 3-5 Slant View

1. Turn off system power switch and PC power switch.
2. Open the top cover.
3. Push over upper chassis gently. (Fig. 3-5)
   - Remove fixing screws on the right and left side panels in advance.
   - Confirm the click sound when a stay is fixed.
4. Remove front panel first and then upper panel.
   - Refer to the chapter 1, page1-5.
5. Remove a sample tray if still there.
6. Disconnect the following connectors.
   - J4101 J4102 J4103 J4104 J7013
7. Loosen and remove three unit fixing screws.
8. Hold the upper part of case and lift up the unit to remove.

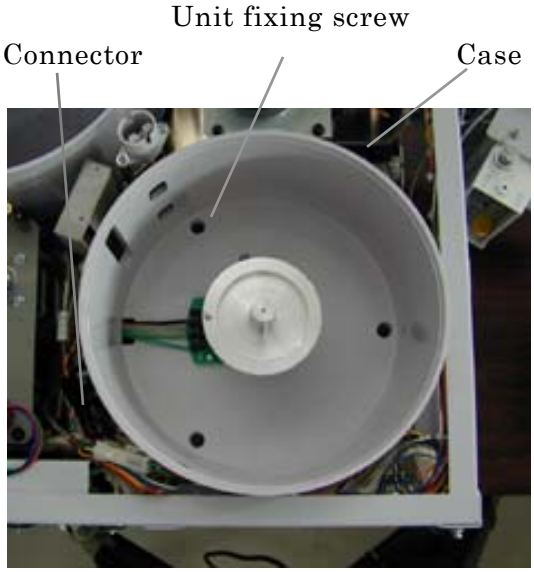


Fig. 3-6 Sampler (enlarged)

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

1) Electric power should be off before the maintenance.
   - If connecting or disconnecting while power is ON, electronic parts may be damaged by electric shock.
2) Sample probe should be moved to the cuvette position.
   - The probe may be distorted if touched.

3.2. Sample Pipette (STM)

3.2.1. Parts and Configuration

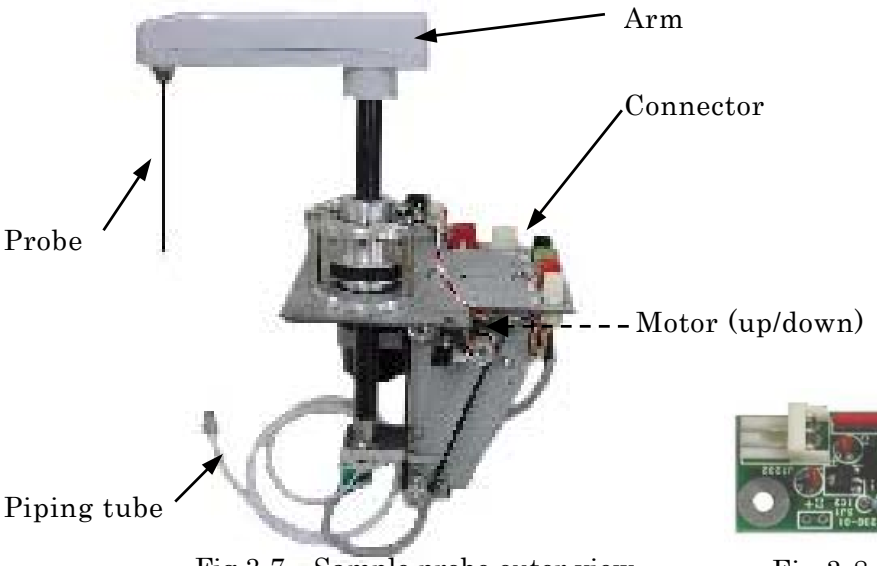


Fig.3-7 Sample probe outer view

Fig.3-8 SLS PCB

- Refer to “ASSY-4 STM” for the unit assembly drawing.
- Refer to “WIRING-7 STM” for the unit wiring diagram.
- Refer to “Operation manual 5.2.1 Sample probe” for the probe exchange.

3.2. Function and Action

1. Function

Various samples, such as patient, standard and control samples, are aspirated from sample cups at the amount of designated plus small excess then dispensed designated amount into cuvettes.

Sample probe itself has level sensing function. When it detects sample level, probe stops going down. Then the fixed amount (designated plus excess) will be aspirated by sample pump.

After aspiration, probe goes up and rotates to above the cuvette position, goes down into a cuvette, and again detects the first reagent level. Here the designated amount of sample is dispensed into the reagent.

After the dispensation, probe goes up and rotates to above the washing pot and then goes down into the pot. Then the both inside and outside of probe are washed. The excess sample in the probe is washed out by inside washing water. After that, water droplet at the probe tip is sucked up in the pot.

2. Action (Refer to Fig. ASSY-4.)

When a stepping motor ⑫ rotates, the rotation is transferred to pulley ⑩ by timing belt ⑪ and then transferred to probe ⑥ through spline shaft ⑧ and STM arm ④.

Pulley ⑩ has a shade pin ⑭, which shades the light of home position sensor ⑨ at home position. This detects home position at initialization.
· The home position of rotation is reaction cuvette position (dispensation position).

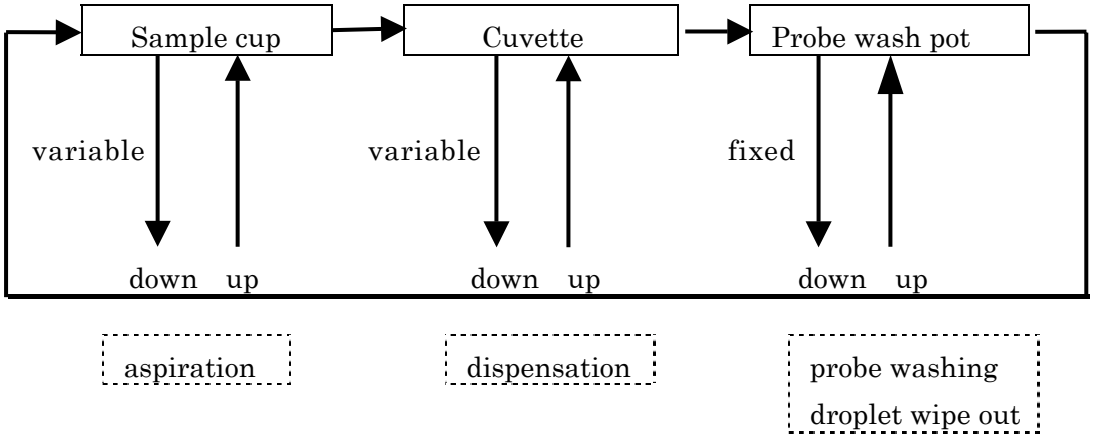
When home position sensor detects home position, rotary encoder is reset and output will be zero.

When stepping motor ⑰ rotates, the lower part of spline shaft ⑧ goes up and then probe ⑥ also goes up.

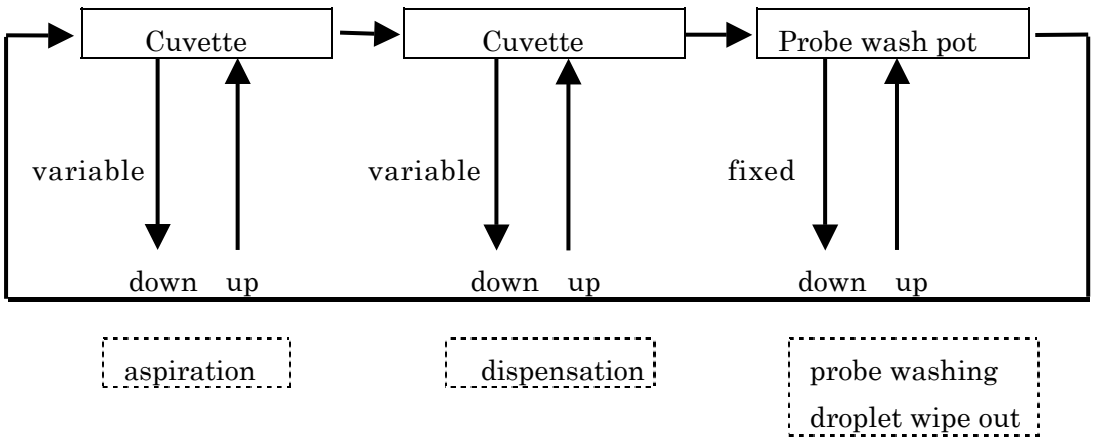
Shade plate is fixed to the lower part of spline shaft ⑧ and this plate shades the light of sensor ⑱ at home position. This detects home position at initialization.
· The home position of up/down motion is the top position.

3. The measurement procedure

1) Normal operation



2) Sample dilution operation



During the measurement, rotary encoder counts motor rotation angle and sample probe rotation position is checked.

· If rotation angle exceeds the limit or it consumed too much time, an alarm is given and emergency stop is made.

Before rotation starts, analyzer checks if up/down movement position is at the home position.

· If it will not be at the home position within the fixed time, analyzer gives alarm and emergency stop.

3.2.3. Unit dismantling and re-assembly

1. Unit dismantling

Fig. 3-9 System slant view

1) Turn off system power switch and PC power switch.

2) After opening top cover, push over upper chassis gently to give a tilt.

- Be sure to remove fixing screws on left and right panels in advance.
- Confirm the "click" sound made by a stay when fixed.

3) Remove front panel first, and then upper panel.

- Refer to chapter 1, page 1-5.

Fig.3-10 Pump location

4) Loosen M6 joint of sample pump and disconnect tube.

- When disconnecting tube, water in the tube flows out. Wipe it off with tissue paper.

5) Disconnect the following connectors.
- J4201 J4202 J4203 J4204 J4205 J4208

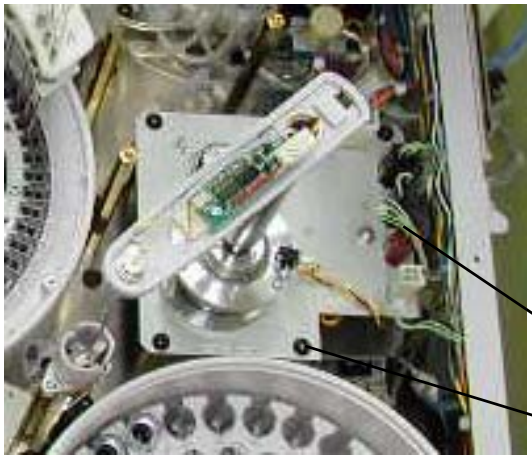


Fig. STM surrounding

6) Remove unit fixing screws (four).

7) While holding base plate and spline shaft bearing, pull up the unit to remove, taking care of tubes and wiring.

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

1) Electric power should be off before the maintenance.

・If connecting or disconnecting while power is ON, electronic parts may be damaged by electric shock.

2) Do not hold STM arm when lifting up the unit.

・The probe may be distorted if touched.

3) When removing M6 joint, wipe off the water flown from tube, before moving the tube to the bottom of unit.

・If water is carried into STM section, electric parts such as sensors may be damaged.

3.3. Sample Pump (SP)

3.3.1. Parts and Configuration

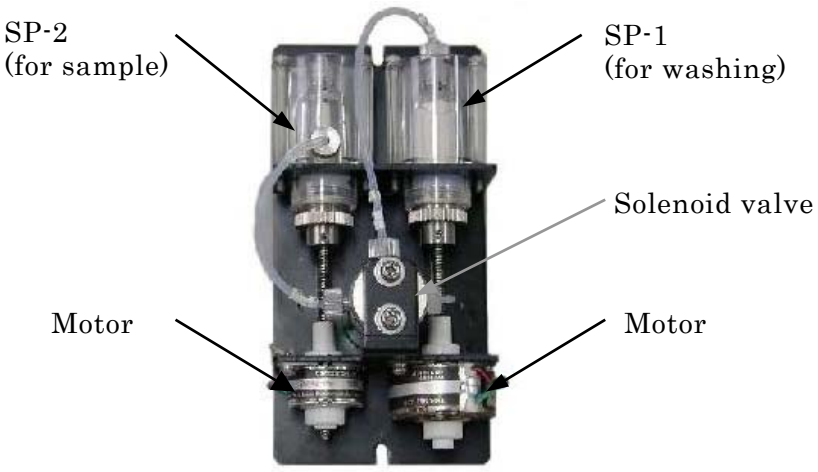


Fig. 3-12 Sample pump

- Refer to "ASSY-5 SP" for the unit assembly drawing.
- Refer to "WIRING-8 SP" for the unit wiring diagram.

3.3.2. Function and Action

1. Function

Various samples, such as patient, standard and control samples, are aspirated from sample cups at the amount of designated plus small excess then dispensed designated amount into cuvettes by the pump.

The amount of sample can be set as follows.
- 2 μL– 30 μL (Variable by 0.5 μL step)

Separation air volume, which prevents mixing of sample and water in the probe, and excess sample amount to increase accuracy of dispensation volume are set as follows.

- Separation air volume (To prevent mixing of washing water and sample.)
  2 μL (constant)
- Excess amount (To increase dispensation accuracy.)
  5 μL (constant)
- After air volume (To prevent sample splash while probe rotation.)
  1 μL (constant)

At sample aspiration, designated sample volume (2 - 40 μL) plus excess volume (5 μL) is aspirated after separation air 2 μL is aspirated, and then air 1 μL is aspirated.

At sample dispensation, air 1 μL and designated sample volume (2 - 40 μL) is dispensed into cuvettes.

2. Action (Refer to "ASSY-5" for assembly drawing.)

The shafts of stepping motors ⑦ and ⑬ slide up or down when pulse is given. This sliding motion is transferred to plungers ③ and ⑩.

Plungers ③ and ⑩ have shade pins which shade home position sensor light at home position. This detects home position at initialization.
· Home position is at the top. (Dispensation ending position)

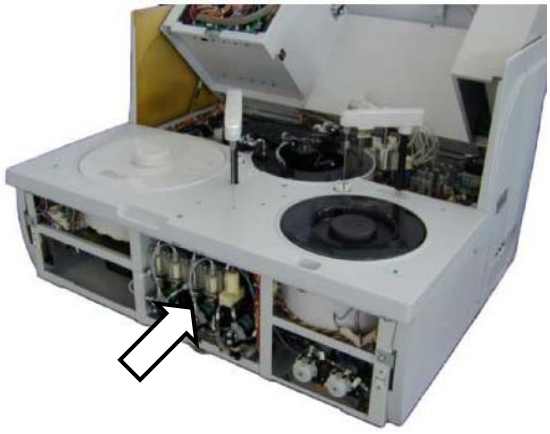
At aspiration, shafts of stepping motors ⑦ and ⑬ go down, and plunger also goes down.

At dispensation, shafts of stepping motors ⑦ and ⑬ go up, and plunger also goes up.

If plunger will not be at the home position within the fixed time, analyzer gives an alarm and emergency stop.

3.3.3. Unit dismantling and re-assembly

1. Unit dismantling

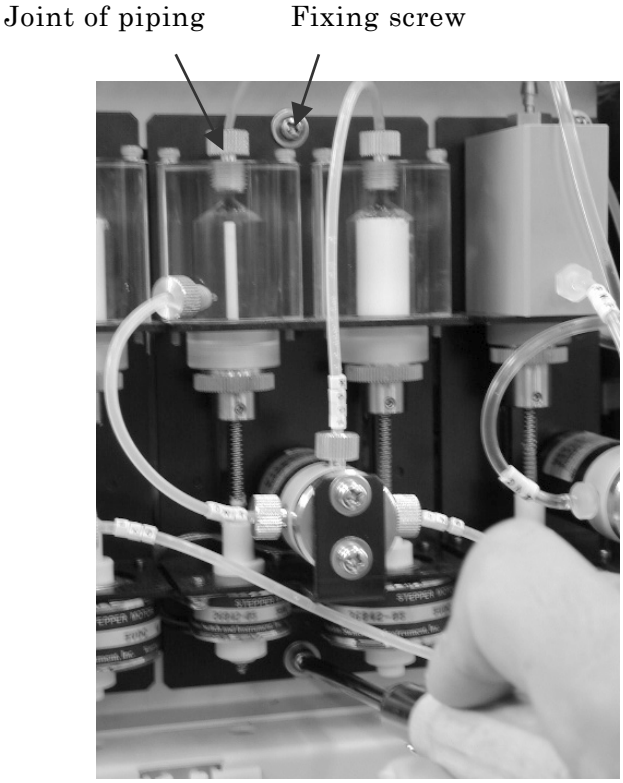


1) Turn off the system power source and PC power switch.

2) Open top cover.

3) Remove front panel.
   · Refer to chapter 1, page 1-5.

Fig. 3-13 System slant view



4) Loosen M6 joints (two) connected to pump head and solenoid valve respectively, and remove piping.

   · When removing piping, washing solution in piping tube is frown backwards. Wipe it up with tissue paper.

5) Loosen screws (two) fixing unit and remove them, and then remove unit.

6) Remove five connectors connected to unit.
   J4307 J4305 J4314 J4315 J4317

Fig. 3-14 SP

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

Electric power should be off before the maintenance.

・If connecting or disconnecting while power is ON, electronic parts may be damaged by electric shock.

When removing M6 joints, wipe up the water flown from tube.

・If water is carried into electric parts such as sensors, they may be damaged.

3.3.4. Exchange of U-packing

This pump consists of SP-1 (for washing) and SP-2 (for samples).
The procedure of U-packing exchange is the same, so the following explanation is done for SP-1.

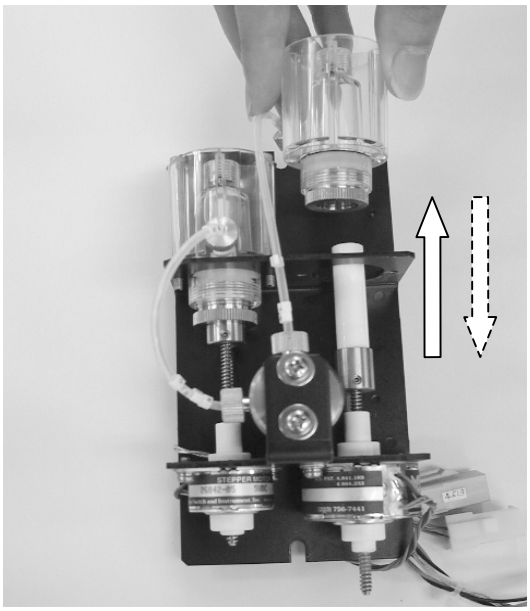


Fig. 3-15 Removal of pump head

1) Remove sample pump form the system. (Refer to 3.3.3. Unit dismantling)

2) Loosen pump head fixing screws (two) and pull out them from unit to remove.

3) Loosen screws and remove the pump from pump head.

4) Remove spacer form pump head with tweezers.

5) Take out U-packing from pump head, using tweezers

   · U-packing is inserted in pump head very tightly. So take it out forcibly.

   · Take care not to scratch inside of pump head with the tips of tweezers.

6) Apply a little silicon grease around rubber of U-packing, and insert it in pump head with tweezers

   · Silicon grease helps it easier to insert U-packing in pump head.

7) After inserting spacer in pump head, tighten screw lightly.

8) After installing pump head to the body, tighten fixing screws firmly.

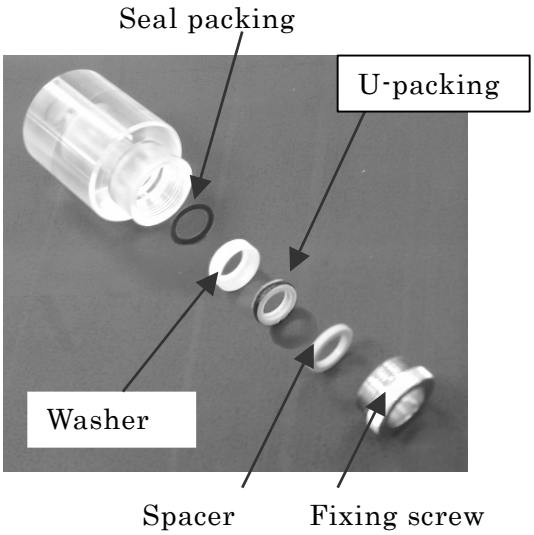


Fig. 3-16 Dismantling of pump head

3.4. Reagent Tray (RGT)

3.4.1. Parts and Configuration

Fig. 3-17 Reagent tray

Fig. 3-18 Tray without bottle case

Fig. 3-19 Tray for 24 items

Fig.3-20 Tray for 36 items

- Refer to “ASSY-6 RGT” for the unit assembly drawing.
- Refer to “WIRING-9 RGT” for the unit wiring diagram.

3.4.2. Function and Action

1. Function

The set reagent bottles for the items (48) can be set on the tray.

Reagent bottles are set on the tray and the tray with the set reagent, dilluent and washing solution bottles are transferred and rotated to the dispensation position of reagent probe.

The tray can keep reagents cool as long as main power switch on the back of the system is ON.

2. Action (Refer to "ASSY-6" for assembly drawing.)

When stepping motor ⑦ rotates, bottle case ④ rotates via plain gears ⑧⑨.

Bottle case ④ has radiation plate ⑮ in the center of the bottom, and the radiation plate has shade pin which shades the light of home position sensor ⑰. This detects home position at initialization. (Position No.1 comes to the reagent dispensation position.)

At that time, the reading of the rotary encoder (united with motor) is reset to zero.

In analyzing, the tray carries selected reagent bottles to the reagent dispensation position.

Rotation angle of motor is counted by rotary encoder (united with motor) and rotation angle of bottle case is checked.

- If rotation angle exceeds the limit or it consumed too much time, an alarm is given and emergency stop is made.

3. Temperature control

The sensor of temperature ⑬ attached to the lower part of bottle case ④ senses temperature, and power supply to Peltier element ⑩ is controlled by digital thermo.
Digital thermo is located on the left side panel of the system. (Refer to Fig. 1-11, pages1-8.
Explanation of this digital thermo is omitted.

3.4.3. Unit dismantling and re-assembly

1. Unit dismantling

Fig. 3-21 System slant view

1. Turn off system power source and PC power switch.
2. Open top cover and push over upper chassis gently to give a tilt.
   - Make sure to remove fixing screws on left and right panels in advance.
   - Confirm the "click" sound made by a stay when fixed.
3. Remove front panel first, and then upper panel.
   - Refer to Chapter 1, page 1-5.
4. Hold bottle case by edge to lift up and remove bottle case.
5. Remove the following wiring connectors.

   J4706 J4707 J4701 J4702 J4703
6. Loosen unit fixing screws (four), and remove them.
7. Hold the upper part of outer case, and lift up unit to remove.

Fig. 3-22 Reagent tray surroundings

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

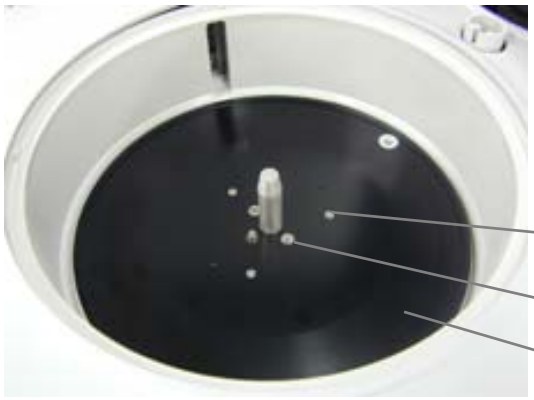
1) Electric power should be off before the maintenance.

- If connecting or disconnecting while power is ON, electric parts may be damaged by electric shock.

2) Move reagent probe to cuvette.

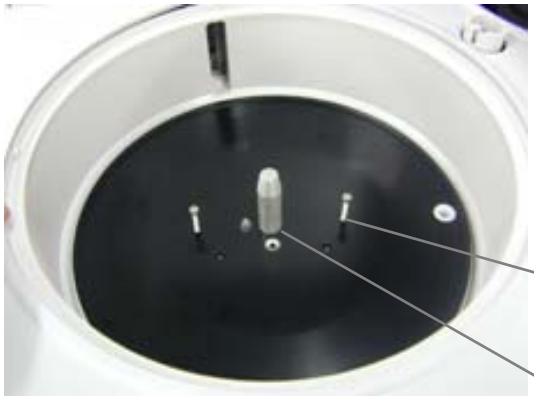
・The probe may be distorted if touched.

3.4.4. Exchange of Peltier Element



1. Remove bottle case.
2. Loosen M3 screws (three) and M4 screws (two) and remove them from the black plate.

Fig. 3-23 Reagent tray



3. To make it easy to take out the plate, twist removed M3 screws (two) into the plate.

Fig. 3-24 Reagent tray

4. Hold M3 screws (two) with fingers. And lift up the plate, while holding down the top of revolving shaft by your thumb.

Fig. 3-25 Reagent tray

Fig. 3-26

5. Take out the plate and then insulator.

Fig. 3-27

6. Take out revolving shaft.
   Leave temperature sensor set in revolving shaft as it is, and put this revolving shaft nearby.

Fig. 3-28

7. Take out connector of Peltier element.

8. Take out Peltier element.

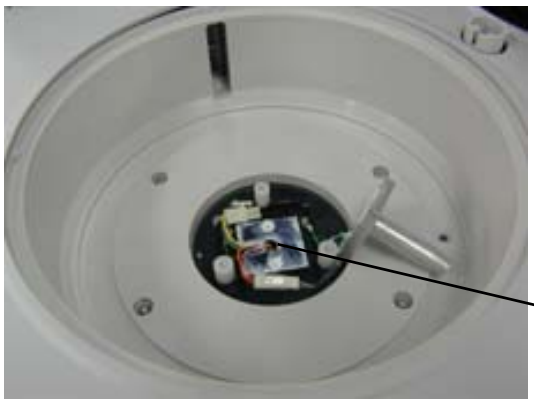


Fig. 3-29

9. The left side view shows reagent tray without Peltier element

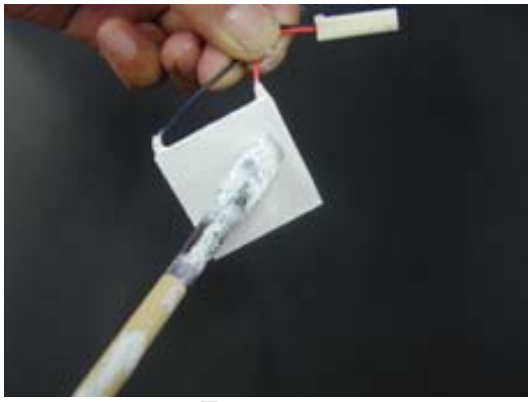


Fig. 3-30

10. Apply heat sinker to both sides of new Peltier element thinly and uniformly.

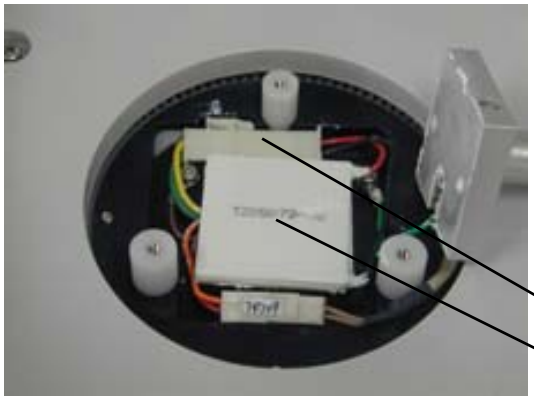


Fig. 3-31

11. Set Peltier element as shown on the left side, while holding down.

- Be sure to put Peltier element with the letters on it up.

12. Assemble with the reverse procedure of the above.

3.5 Reagent Pipette (RTM)

3.5.1. Parts and Configuration

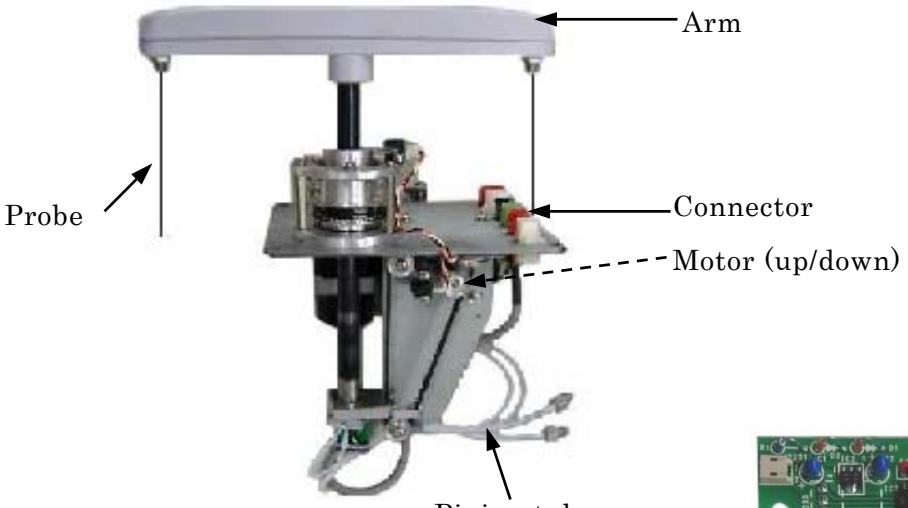


Fig. 3-32 Reagent probe

Fig. 3-33 RLS board

- Refer to "ASSY-7 RTM" for the unit assembly drawing.
- Refer to "WIRING-10 RTM" for the unit wiring diagram.
- Refer to "Operation manual 5.2.2 Reagent probe" for the probe exchange.

3.5.2. Function and Action

1. Function

Reagent, dilluent and washing solution, etc. are aspirated from reagent bottle at the amount of designated plus small excess, then dispensed designated amount into reaction cuvettes.

Reagent probe itself has level sensing function. When the tip of probe detects reagent level, probe stops going down. Then the fixed amount (designated plus excess) will be aspirated by reagent pump.

After aspiration, probe goes up and rotates to above the cuvette position and goes down into a cuvette, and stops at the set level. Here the designated amount of reagent is dispensed by reagent pump.

After the dispensation, probe goes up and rotates to above the washing pot and then goes down into the pot. Then the both inside and outside of probe are washed and the excess reagent in the probe is washed out by inside washing solution. After that, water droplet at the probe tip is sucked up in the pot.

2. Action (Refer to Fig. ASSY-7.)

When a stepping motor ⑫ rotates, the rotation is transferred to pulley ⑩ by timing belt ⑪ and then transferred to probe ⑥ through spline shaft ⑧ and RTM arm ④.

Pulley ⑩ has a shade pin ⑭, which shades the light of home position sensor ⑨ at home position. This detects home position at initialization.

· The home position of rotation is the position where R1 probe is at cuvette position.

When home position sensor detects home position, rotary encoder (united with motor ⑫) is reset and output will be zero.

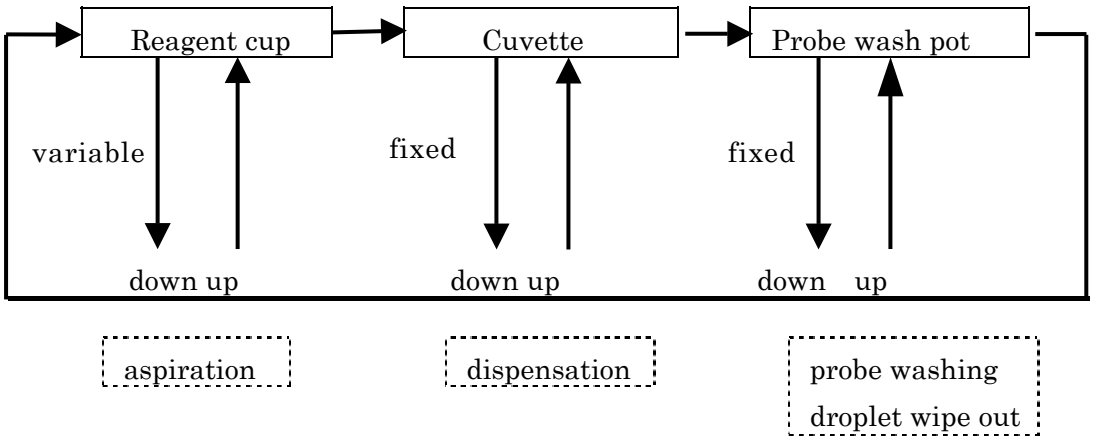
When stepping motor ⑰ rotates, the lower part of spline shaft ⑧ fixed to timing belt ⑲ goes up and then probe ⑥ also goes up.

Shade plate is fixed to the lower part of spline shaft ⑧ and this plate shades the light of sensor ⑱ at home position. This detects home position at initialization.

· The home position of up/down motion is the top position.

3. The measurement procedure

1) Normal operation



During the measurement, rotary encoder counts motor rotation angle and reagent probe rotation position is checked.

· If rotation angle exceeds the limit or it consumed too much time, an alarm is given and emergency stop is made.

Before rotation starts, analyzer checks if up/down movement position is at the home position.

· If it will not be at the home position within the fixed time, analyzer gives an alarm and emergency stop.

3.5.3. Unit Dismantling and Re-assembly

1. Unit dismantling

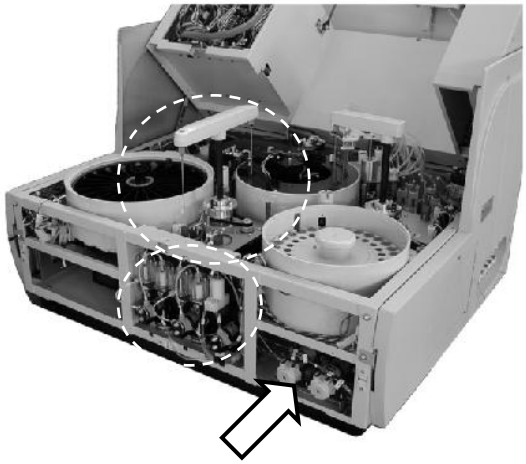


Fig. 3-34 System slant view

1. Turn off system power switch and PC power switch.
2. After opening top cover, push over upper chassis gently to give a tilt.

   ・Be sure to remove fixing screws on left and right panels in advance.

   ・Confirm the “click” sound made by a stay when fixed.
3. Remove front panel first, and then upper panel.

   ・Refer to chapter 1, page 1-5.

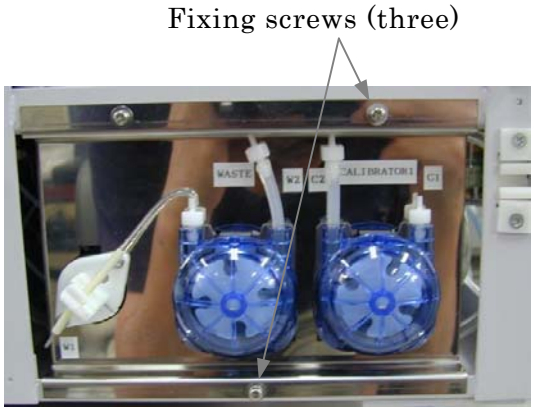


Fig. 3-35 ISE pump

4. Loosen fixing screws of ISE pump, and take out ISE pump. (Leave piping and wiring as they are.)

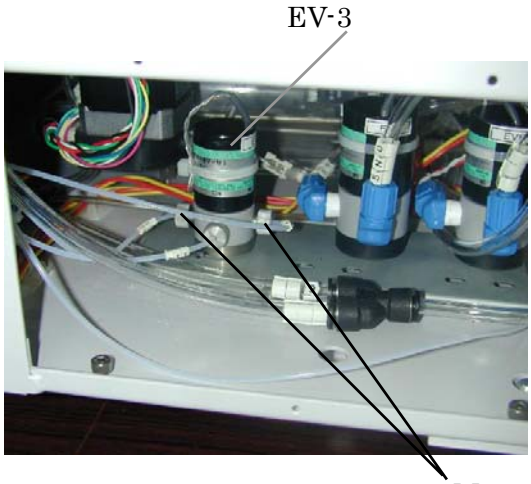
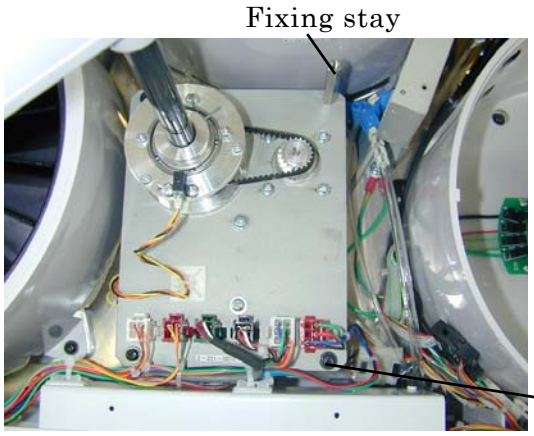


Fig.3-36 Solenoid valve

5. Loosen M6 joints (two) connected to both ends of solenoid valve (EV-3) and disconnect tube.

   ・When disconnecting tube, water in the tube flows out. Wipe it off with tissue paper.
6. Disconnect the following connectors.
   J4401 J4402 J4403 J4404
   J4405 J4408



7. Loosen fixing screws (three) of unit and stay, and remove them.

8. While holding base plate and spline shaft bearing, pull up the unit to remove, taking care of tubes and wiring.

Fig. 3-37 RTM (enlarged)

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

1) Electric power should be off before the maintenance.

・If connecting or disconnecting while power is ON, electronic parts may be damaged by electric shock.

2) Do not hold arm when lifting the unit up.

・The probe may be distorted if touched.

3) When removing M6 joint, wipe off the water flown from tube, before moving the tube to the bottom of unit.

・If water is carried into electric parts such as sensors, they may be damaged.

3.6. Reagent Pump (RP)

3.6.1. Parts and Configuration

Fig.3-38 Reagent pump

- Refer to “ASSY-8 RP” for the unit assembly drawing.
- Refer to “WIRING-11 RP” for the unit wiring diagram.

3.6.2. Function and Action

1. **Function**

Reagent, dilluent and washing solution, etc. are aspirated from reagent bottle at the amount of designated plus small excess, then dispensed designated amount into reaction cuvettes.

The amount of reagent can be set as follows.
- 20 μL– 300 μL (Variable by 0.5 μL step)

Separation air volume which prevents mixing of reagent and water in the tube and excess sample amount to increase accuracy of dispense volume are set as follows.

- Separation air volume (To prevent mixing of washing water and sample.)
  20 μL (constant)
- Excess amount (To increase dispense accuracy.)
  10 μL (constant)

At reagent aspiration, designated reagent volume (20 - 300 μL) plus excess volume (10 μL) is aspirated after separation air 20 μL is aspirated.

At reagent dispensation, designated reagent volume (20 - 300 μL) is dispensed into reaction cuvettes.

2. Action (Refer to "ASSY-8" for assembly drawing.)

The shafts of stepping motors ⑦ and ⑬ slide up or down when pulse is given. This sliding motion is transferred to plungers ③ and ⑩.

Plungers ③ and ⑩ have shade pins which shade home position sensor ⑥ light at home position. This detects home position at initialization.
· Home position is at the top. (Dispense ending position)

At aspiration, shafts of stepping motors ⑦ and ⑬ go down, and plunger also goes down.

At dispensation, shafts of stepping motors ⑦ and ⑬ go up, and plunger also goes up.

In measurement, if plunger will not be at the home position within the fixed time, analyzer gives an alarm and emergency stop.

3.6.3. Unit Dismantling and Re-assembly

1. Unit dismantling

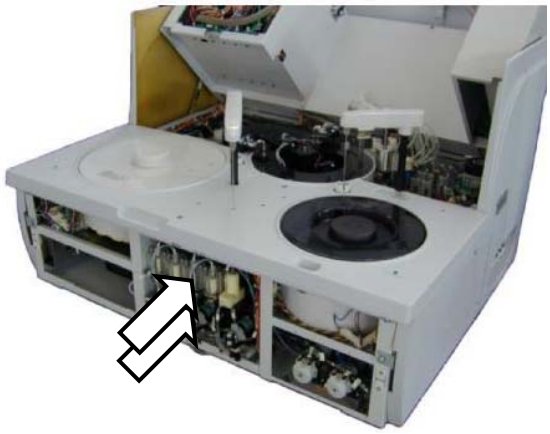


Fig. 3-39 System slant view

1. Turn off the system power source and PC power switch.
2. Open top cover.
3. Pull and remove front panel.
   · Refer to chapter 1, page 1-5.

Fig. 3-40 RP

4. Loosen M6 joints (two) connected to pump head and solenoid valve respectively, and remove piping.

   · When removing piping, washing solution in piping tube is frown backwards. Wipe it up with tissue paper.

5. Loosen screw (one) fixing unit and remove it, and then remove unit.

   · One of two fixing screws has already been removed as shown in 3) above.

6. Remove five connectors connected to unit.

   J4505 J4507 J4514 J4515 J4517

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

Electric power should be off before the maintenance.

- If connecting or disconnecting while power is ON, electric parts may be damaged by electric shock.

When removing M6 joints, wipe up the water flown from tube.

- If water is carried into electronic parts such as sensors, they may be damaged.

3.6.4. Exchange of U-packing

This pump consists of PR-1 (for washing) and PR-2 (for samples).

The explanation for exchange of U-packing is omitted, for the procedure is the same as in sample pump. Refer to page 3-13.

3.7. Reaction Tray (RCT)

3.7.1. Parts and Configuration

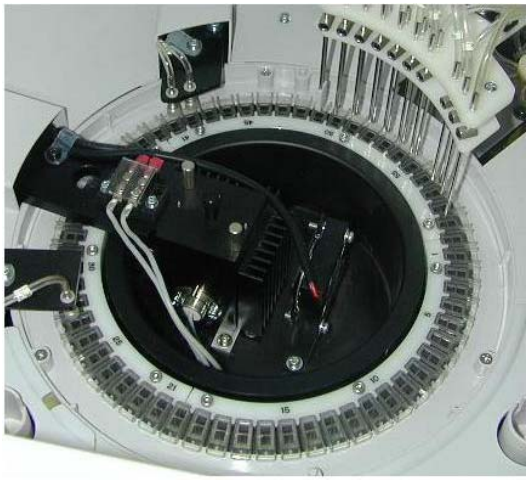


Fig. 3-41 Reaction tray surroundings

Fig. 3-42 Reaction tray

- Refer to “ASSY-9-1/2, 2/2 RCT” for the unit assembly drawing.
- Refer to “WIRING-12 RCT” for the unit wiring diagram.
- Refer to “Operation manual 5.2.3 Reaction Cuvette” for the cuvette exchange.

3.7.2. Function and Action

1. Function

This tray can hold fifty (50) reaction cuvettes and keep the temperature in cuvettes at 37℃.

In these cuvettes, reagent and samples are made react.

Reaction cuvette is optical cell for absorbance measurement.
(Reaction cuvette direct photometry method)

2. Action (Refer to "ASSY-9-1/2, 2/2" for assembly drawing.)

When the stepping motor ⑰ rotates, this rotating motion is transferred to heat blocks ⑥⑦⑩ through timing belt ⑱, pulley ⑯ and revolving plate ⑭.

Revolving plate ⑭ has a shade pin which shades home position sensor ⑮ light at home position. This detects home position at initialization.

When home position is detected, rotary encoder (united with motor) is reset, and the output shows zero.

During measurement, the following pitches are sent in one cycle.
And one pitch (one reaction cuvette) is advanced counterclockwise in excess by the cycle.

- Motion A : 13 pitches
- Motion B : 21 pitches
- Motion C : 27 + 60 pitches

  Total : 121 pitches (2 cycles + 1 pitch)

Rotation angle of motor is counted by rotary encoder (united with motor), and rotation angle of heat block is checked.

- If rotation angle exceeds the range of tolerance or rotation time exceeds permissible time, analyzer gives an alarm and emergency stop.

3. Temperature control

Temperature of heat block ⑩ is detected by two temperature sensors ⑨ fixed to the side of heat block ⑩, and heater ⑪ is accurately controlled by PID control of TCD PCB. (Heat block temperature : 37℃±0.1℃)

As protecting function, thermostat ⑫ is installed to the lower part of heat block ⑦.
In case the temperature exceeds 70℃, electric current to heater ⑪ is turned OFF.

3.7.3. Unit Dismantling and Re-assembly

1. Unit dismantling

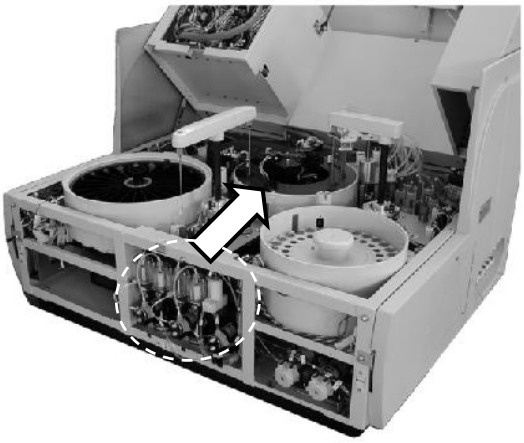


Fig. 3-43 System slant view

1. Turn off system power source and PC power switch.
2. Open top cover and push over upper chassis gently to give a tilt.
   - Make sure to remove fixing screws on left and right panels in advance.
   - Confirm the “click” sound made by a stay when fixed.

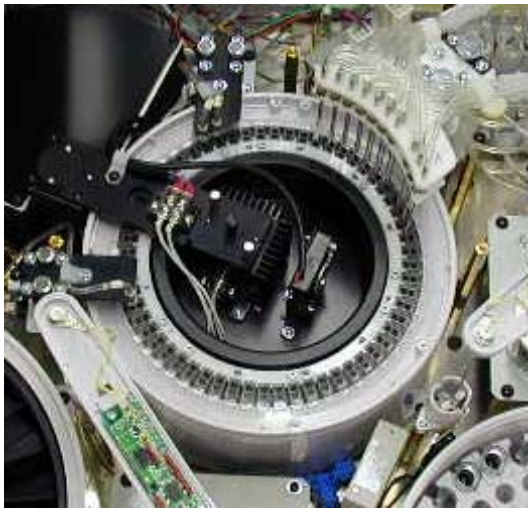


Fig. 3-44 Reaction tray surroundings

3. Remove front panel first, and then upper panel.
   - Refer to Chapter 1, page 1-5.
4. Remove the plate.
5. Holding RTM arm, rotate and move it to reagent tray.
6. Remove cuvette covers (two).

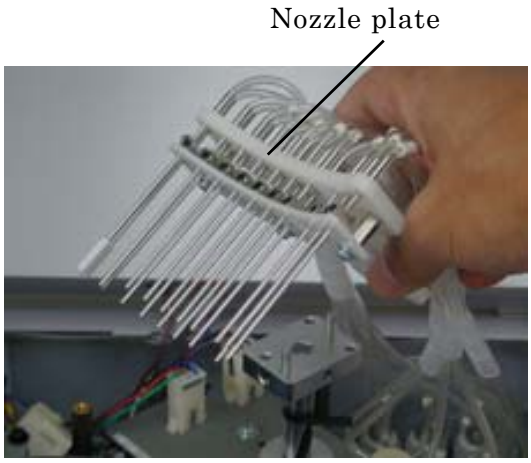
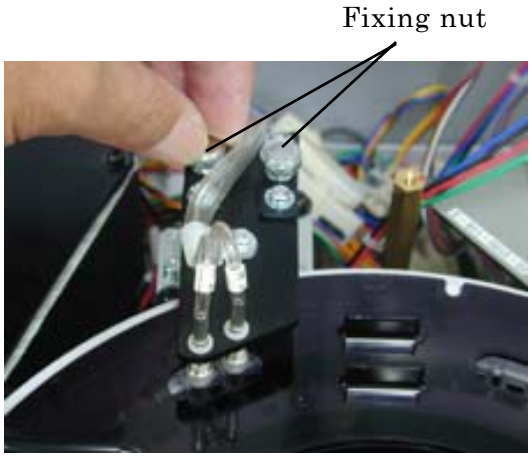


Fig. 3-45 Reaction cuvette washing mechanics

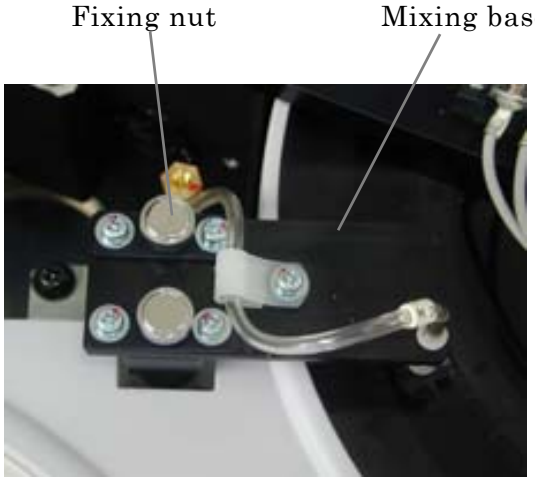
7. After taking off nut fixing nozzle plate of reaction cuvette washing mechanics, remove nozzle plate.
   - Put removed nozzle plate nearby lightly with piping as it is.



8. After removing fixing nuts (two) of MU-1, remove MU-1.

   ・ Lay removed MU-1 nearby lightly with mixing base and piping.

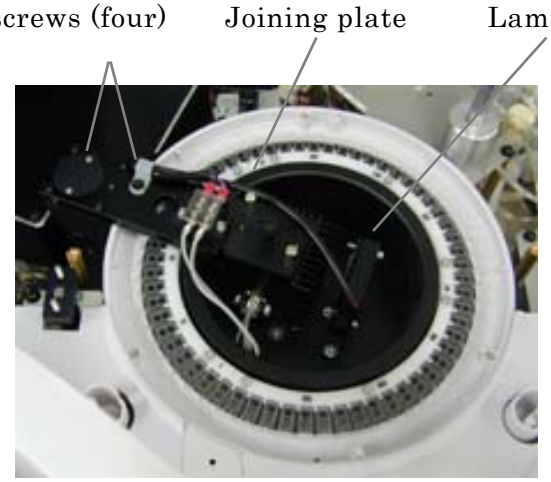
Fig. 3-46 MU-1



9. After removing fixing nuts (two) of MU-2, remove MU-2

   ・ Lay removed MU-2 nearby lightly with mixing base and piping.

Fig. 3-47 MU-2



10. Remove fixing screws (four) of joining plate.

Fig. 3-48 Lamp house surroundings

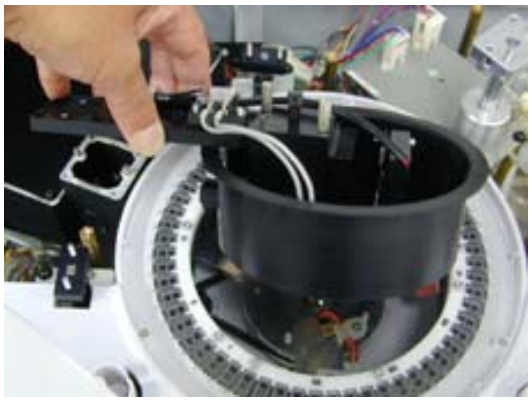


Fig. 3-49 Removal of lamp house

11. Holding joining plate, lift it up and remove the plate and lamp house all together.

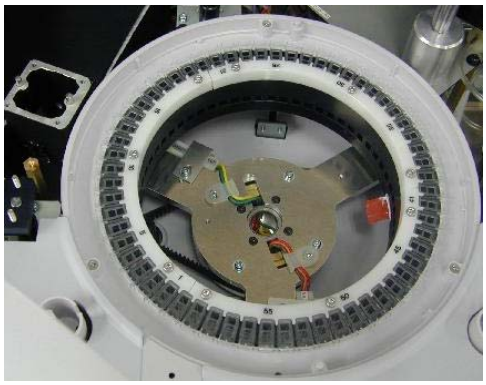


Fig. 3-50 Lamp house surroundings

12. Remove connectors fixed to unit.
    - J4601 J4602 J4603 J4605 J4606
    - Earth terminal connected to base plate.

13. Remove fixing screws (three) of unit.

14. Holding case of unit, lift it up and remove it.

2. Cautions

1) Electric power should be off before the maintenance.

   If connecting or disconnecting while power is ON, electronic parts may be damaged by electric shock.

2) When removing reaction cuvettes, lay them in numeric order for convenience of setting back.

   You can use the information in memory of PC later.

3) When taking out reaction cuvettes, take great care not to touch optical path face.

   If touched, wipe off finger marks gently with soft paper.

4) When taking lamp out, take great care not to touch the glass of lamp.

   If touched, wipe off finger marks with soft paper soaked in alcohol.

3.8. Mixing Unit 1, 2 (MU-1, MU-2)

3.8.1. Parts and Configuration

Fig. 3-51 MU-1

Fig. 3-52 MU-2

- Refer to "ASSY-10 MU-1, MU-2" for the unit assembly drawing.
- Refer to "WIRING-13 MU-1, MU-2" for the unit wiring diagram.

3.8.2. Function and Action

1. Function

MU-1 performs mixing of R1 and sample, and mixing of Cal-1 and R2 in reaction cuvette by air pressure.

MU-2 performs re-mixing before the measurement by air pressure.

2. Action (Refer to "ASSY-10" for assembly drawing.)

The shaft of stepping motor ⑦ slides up or down when pulse is given. This sliding motion is transferred to mixing base ① through ball spline ③.

Spline bearing ⑤ has a shade pin which shades home position sensor ⑥ light at home position. This detects home position at initialization.

- Home position is at the top.

At descent, shaft of stepping motor ⑦ goes down, and mixing base also goes down.

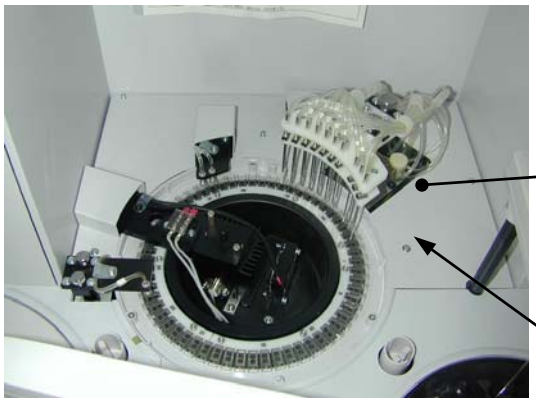
- At descent, it is moved about 1 mm lower than the distance between packing and reaction cuvette, and this excess is absorbed by spring ⑩ for strict adhesion of packing and reaction cuvette.

At ascent, shaft of stepping motor ⑦ goes up, and mixing base ① also goes up.

In measurement, if mixing base will not be at the home position within the fixed time, analyzer gives an alarm and emergency stop.

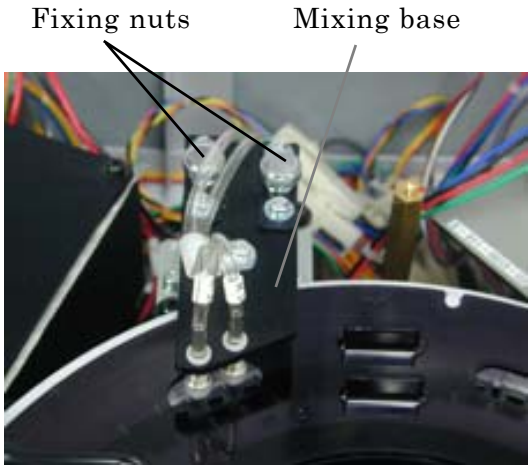
3.8.3. Unit Dismantling and Re-assembly

1. Dismantling



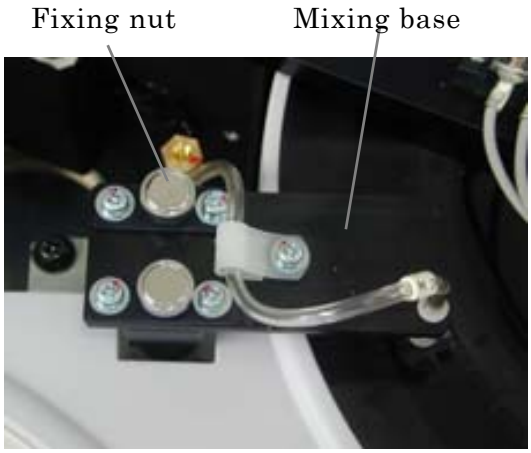
1. Loosen fixing screws (six) of plate and remove the screws.
2. Remove the plate.

Fig. 3-53 Reaction tray surroundings



3. Loosen fixing nuts (two) of mixing base of MU-1, and remove them. And take out mixing base with piping.

Fig. 3-54 MU-1



4. Loosen fixing nuts (two) of mixing base of MU-2, and remove them. And take out mixing base with piping.

Fig. 3-55 MU-2

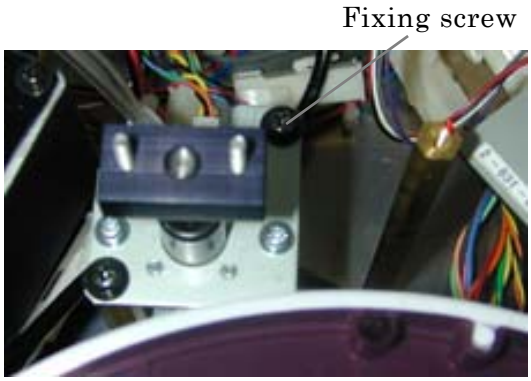


Fig. 56 MU-1

5. Loosen fixing screws (two) of MU-1 and remove them.
And then remove unit

Fig. 57 System slant view

6. To remove MU-2, take off front panel first.
And loosen fixing screws of upper panel to remove them, and take off upper panel.

· Refer to Chapter 1, page 1-5.

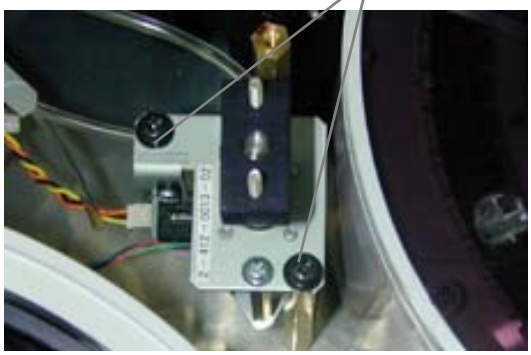


Fig. 58 MU-2

7. After loosening fixing screws (two) of MU-2, take them off.
And then remove MU-2.

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

Electric power should be off before the maintenance.

- If connecting or disconnecting while power is ON, electric parts may be damaged by electric shock.

3.9. Mixing Pump (MP)

3.9.1. Parts and Configuration

Fig. 3-59 Mixing pump

- Refer to "ASSY-11 MP" for the unit assembly drawing.
- Refer to "WIRING-13 MP" for the unit wiring diagram.

3.9.2. Function and Action

1. Function

There are four pumps and one of them is a spare.
Two pumps are to supply MU-1 (two) with air pressure (suction and pressurization), and one is to supply MU-2 with air pressure (suction and pressurization).

2. Action (Refer to "ASSY-11" for assembly drawing.)

When stepping motor ⑩ rotates, the rotation movement is transformed into linear motion through crank shaft ⑧ fixed to motor shaft, flange bush ⑨ and bearing case ⑦. And the linear motion is transferred to Diaphragm ③.

Stepping motor ⑩ drives four pumps ; one side of the shaft drives two pumps And another side drives two pumps.

ON OFF of motor driving is controlled by the time.

3.9.3. Unit dismantling and re-assembly

1. Unit dismantling

Fig. 3-60 Location on 2nd floor

1. Turn off system power switch and PC power switch.
2. After opening top cover, push over upper chassis gently to give a tilt.
   - Be sure to remove fixing screws on left and right panels in advance.
   - Confirm the "click" sound made by a stay when fixed.
3. Remove front panel first, and then upper panel and the plate also.
   - Refer to Chapter 1, page 1-5.
4. Remove piping connected to unit.
5. Remove connector connected to unit.
   J4901
6. Loosen fixing screws (four) of unit and remove them
   And then remove unit.

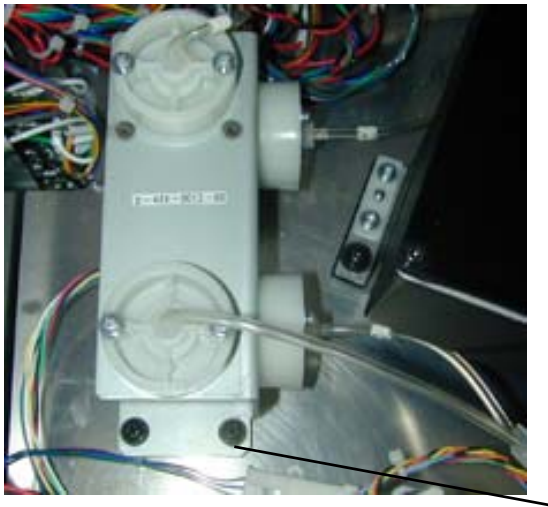


Fig. 3-61 MP surroundings

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

Electric power should be off before the maintenance.

- If connecting or disconnecting while power is ON, electric parts may be damaged by electric shock.

3.10. Spectrophotometer (SPM)

3.10.1. Parts and configuration

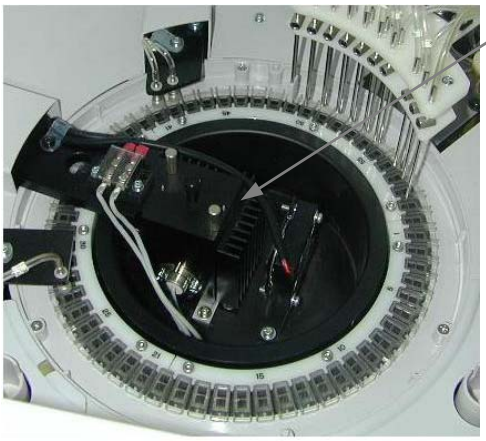


Fig. 3-62 Reaction tray surroundings

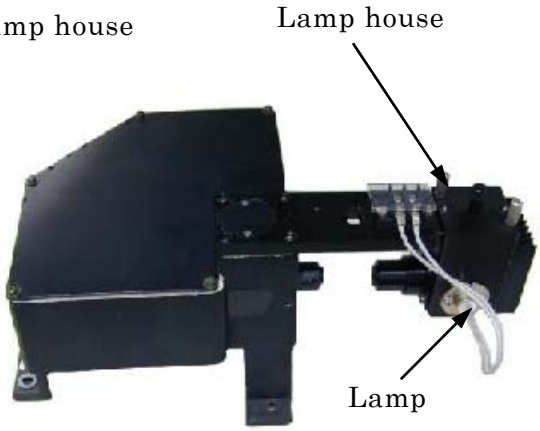


Fig. 3-63 Spectrophotometer

- Refer to “ASSY-12 SPM” for the unit assembly drawing.
- Refer to “WIRING-14 SPM” for the unit wiring diagram.
- Refer to “Operation manual 5.2.7 Light Source” for the lamp exchange.

3.10.2 Function and Action

1. Function

Rear spectrophotometry is adopted.
White light from light source lamp is converged by lens, etc. and is led to go through reaction cuvette, a cell for measurement, and is diverged by concave diffraction grating.

After the diffraction, light energy is measured by 12 individual photo-detectors in each designed wavelength. Monochromatic measurement takes the output of one detector out of twelve, and bi-chromatic measurement takes two.

And the absorbance or the absorbance difference is calculated by the information amplified by an amplifier and then average deviation and logarithmic transformed signals.

2. Specifications

Light source	: DC12V 20W Tungsten Halogen lamp
Spectrum element	: Concave diffraction grating
Light detector	: Silicon Photo-diode
Wavelength	: 12 fixed wavelength

340, 380, 405, 450, 505, 546, 570, 600, 660, 700, 750, 800 nm

Wavelength accuracy	:±2nm
Linearity range	: 0～2.0 Abs.

3.10.3. Unit Dismantling and Re-assembly

1. Unit dismantling

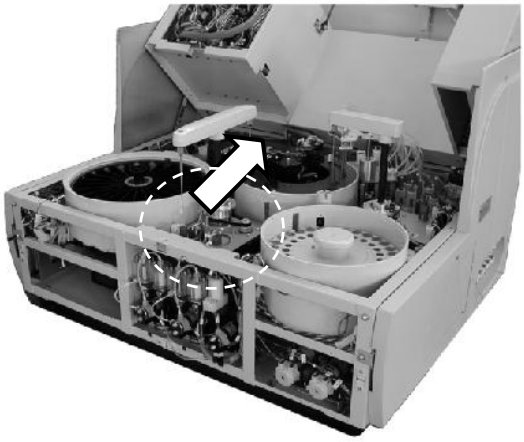


Fig. 3-64 System slant view

1. Turn off system power switch and PC power switch.

2. After opening top cover, push over upper chassis gently to give a tilt.

   ・Be sure to remove fixing screws on left and right panels in advance.

   ・Confirm the “click” sound made by a stay when fixed.

3. Remove front panel first, and then upper panel and the plate also.

   ・Refer to Chapter 1, page 1-5.

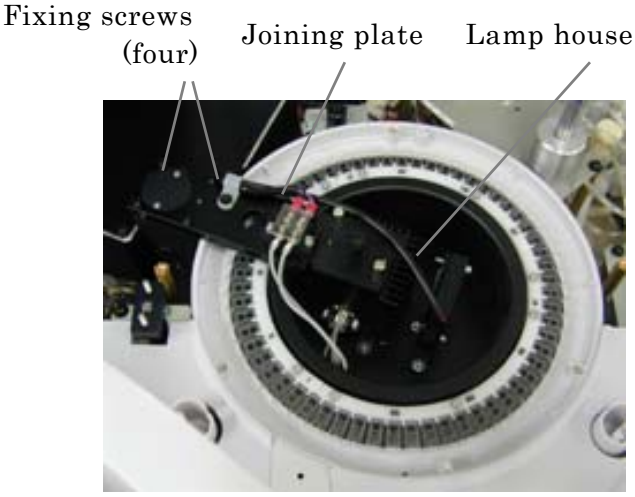
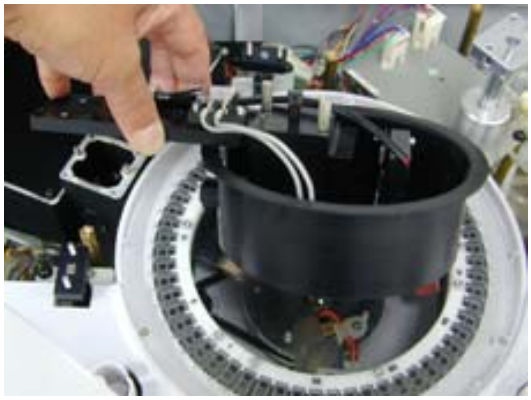


Fig. 3-65 Lamp house surroundings

4. Remove the plate.

5. Remove fixing screws (four) of joining plate.



Fib. 3-66 Removal of lamp house

6. Hold joining plate and lift it up. And then remove lamp house part in all.

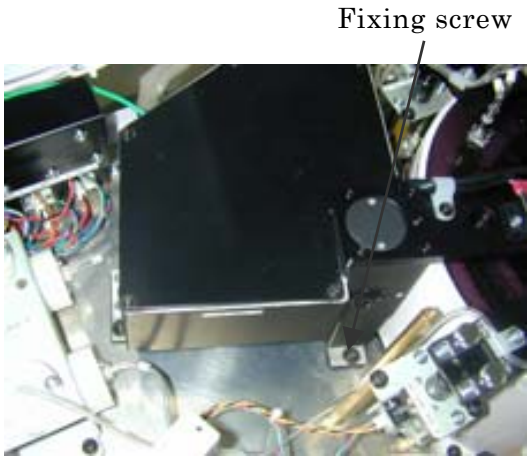


Fig. 3-67 Spectrophotometer

7. Take out connectors connected to unit.
   J6101

8. Loosen unit fixing screws (three) and take them off.

   · Be sure not to loosen screw of position determination plate, or it will be shifted.

9. Lift up unit and remove it.

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

Electric power should be off before the maintenance.

・If connecting or disconnecting while power is ON, electric parts may be damaged by electric shock.

Be sure not to loosen the screw of position determination plate (Fig. 3-66, ⑮).

・ If it is loosened, the position to reaction tray may be shifted at assembly and it may cause inferior performance.

3.11 Reaction Cuvette Washing Station (CWS)

3.11.1 Parts and Configuration

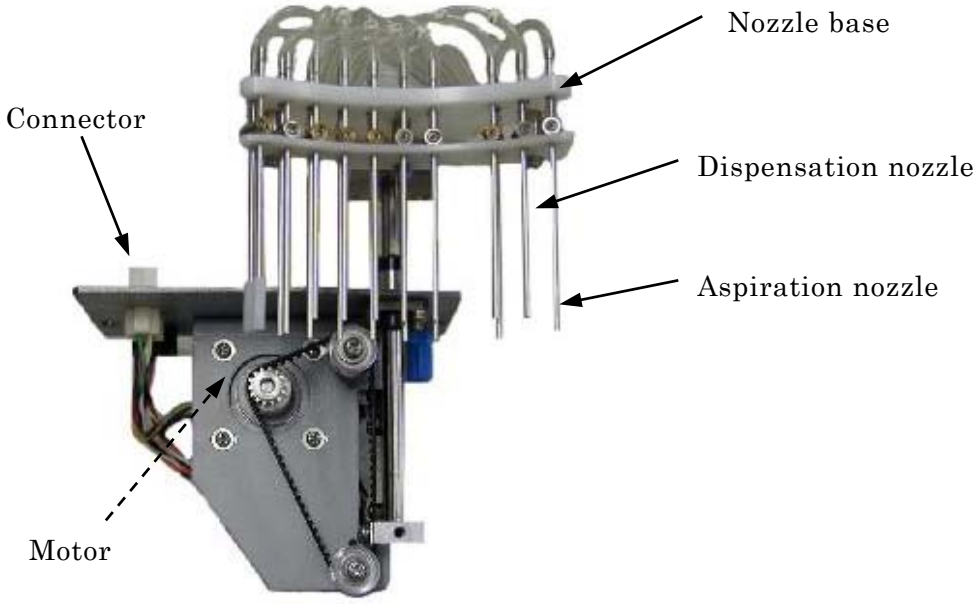


Fig. 3-68 Reaction cuvette washing station

- Refer to "ASSY-13 CWS" for the unit assembly drawing.
- Refer to "WIRING-15 CWS" for the unit wiring diagram.

3.11.2. Function and Action

1. Function

This station is used for removal of reaction liquid after measurement, reaction cuvette washing, and injection and removal of refined water for water blank measurement.

Washing solution is heated to 37℃ by pre-heater (WSH) and dispensed into reaction cuvettes from washing solution dispensation nozzle.

The types of washing solution dispended and the amount are as follows.

1. Alkaline washing solution : 700 μL
2. Acidic washing solution : 700 μL
3. Ion exchange water : 700 μL X 5

Washing solution, which is dispensed into reaction cuvettes, is aspirated and removed by aspiration nozzle.
And at the end, water droplets on the inside wall of cuvettes are aspirated and removed by dry nozzle tip.

2. Action (Refer to "ASSY-13" for assembly drawing.)

When stepping motor ⑫ rotates counterclockwise, spline shaft ⑪ fixed to timing belt ⑱ goes up and nozzle base ② also goes up.

Timing belt ⑱ has a shade pin which shades home position sensor ⑬ light at home position. This detects home position at initialization.

- Home position is at the top position.

At descent, stepping motor ⑫ rotates clockwise by the set numbers of pulse, and nozzle base ② goes down by this rotation.
The sensor is fixed for detecting the lower limit.

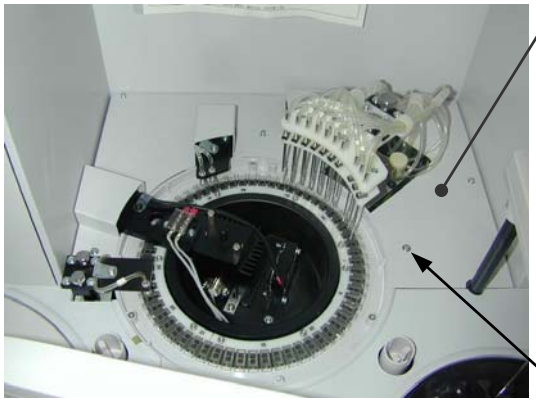
- At descent, nozzle base goes down 1 mm lower than the distance between aspiration nozzle and the bottom of reaction cuvette, and this excess is absorbed by spring ⑥ for strict adhesion of the tip of nozzle and the bottom of reaction cuvette.

Note The direction of motor rotation is shown when seen from the motor shaft side.

In measurement, if nozzle base will not be at the home position within the fixed time, analyzer gives an alarm and emergency stop.

3.11.3. Unit Dismantling and Re-assembly

1. Unit dismantling



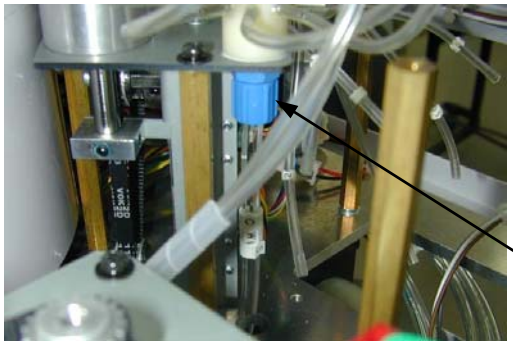
1. Loosen fixing screws (six) of the plate, and remove them.
2. Remove the plate.

Fig. 3-69 RCT surroundings

3. The left side view shows joint part of piping.

   Remove piping for washing (two) inserted in washing nozzles.

Fig. 3-70 Piping of CWS



4. The left side view shows manifold.

   Loosen blue nut under manifold, and remove connected piping.

Fig. 3-71 Blue nut

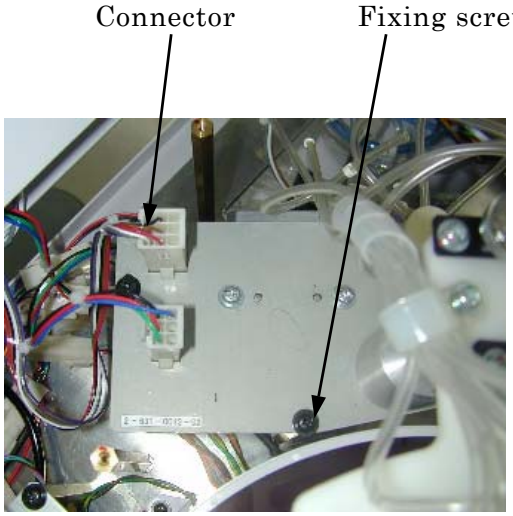


Fig. 3-72 CWS base plate

5. Remove connectors (two).
   J4801 J4803

6. Loosen unit fixing screws (three) and remove them.

7. Lift up unit and remove it.

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

Electric power should be off before the maintenance.

- If connecting or disconnecting while power is ON, electric parts may be damaged by electric shock.

3.12 Reaction Cuvette Washing Pump (CWP)

3.12.1. Parts and Configuration

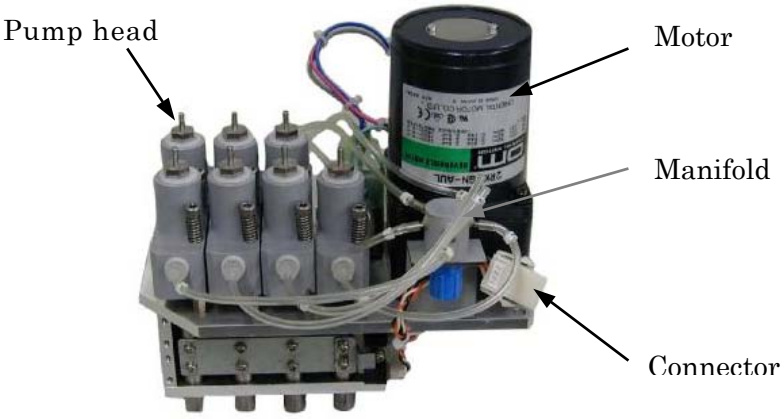


Fig. 3-73 Reaction cuvette washing pump

- Refer to "ASSY-14 CWP" for the unit assembly drawing.
- Refer to "WIRING-15 CWP" for the unit wiring diagram.

3.12.2. Function and Action

1. Function

This pump is used for aspiration of alkaline solution, acidic solution and ion exchange water for washing reaction cuvettes from washing solution and water reservoirs and also for dispensation to reaction cuvettes after heating washing solution to 37℃ by pre-heater (WSH).

The types of washing solution dispended and the amount are as follows.

#1	Ion exchange water	: 700 μL
#2	Alkaline washing solution	: 700 μL
#3	Acidic washing solution	: 700 μL
#4-#7	Ion exchange water	: 700 μL

2. Action (Refer to "ASSY-14" for assembly drawing.)

When AC motor ② rotates, the rotation movement is transferred to plane gear ⑥ through bevel gear ⑩.
The motion of rack ⑬ is transformed into linear motion by the rotation of plane gear ⑥.

ϕ 10 plunger ⑫ connected to rack ⑬ makes a linear motion with it.
Rack ⑬ has a shade plate which shades home position sensor ⑨ light at home position or stop sensor light. This detects home position or stop position.

In measurement, if rack will not be at the home position within the fixed time during measurement, analyzer gives an alarm and emergency stop.

3.12.3 Unit Dismantling and Re-assembly

1. Unit dismantling

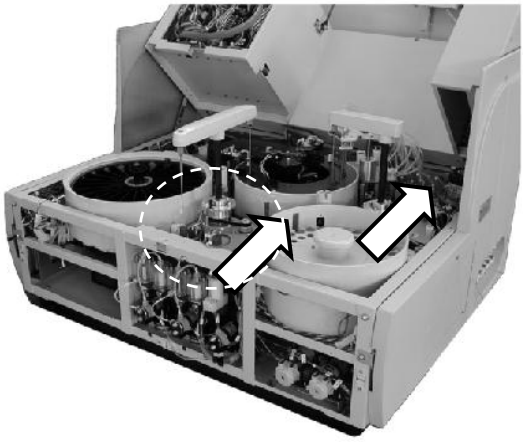


Fig. 3-74 System slant view

1. Turn off system power source and PC power switch.
2. Open top cover and push over upper chassis gently to give a tilt.
   - Make sure to remove fixing screws on left and right panels in advance.
   - Confirm the “click” sound made by a stay when fixed.
3. Remove upper panel.
   - Refer to Chapter 1, page 1-5.
4. Remove the plate.
5. Remove all of seven piping tubes connected to the upper part of pump head, and two tubes for aspiration of washing solution.

Fig. 3-75 CWP surroundings

6. Remove connectors.
   J5201 J5203
7. Loosen blue nut connected under the manifold and remove piping.
8. After loosening unit fixing screws (four), remove them.
9. Holding unit, lift it up and remove it.

Fig. 3-76 CWP

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

Electric power should be off before the maintenance.

- If connecting or disconnecting while power is ON, electric parts may be damaged by electric shock.

When removing piping, wipe up the water flown from tube.

- If water is carried into electric parts such as sensors, they may be damaged.

3.12.4. Exchange of U-packing

Exchange of U-packing is performed by the same procedure as of sample pump (SP). So, the explanation is omitted.
Refer to page 3-13.

3.13. Washing Solution Pre-heater (WSH)

3.13.1. Parts and Configuration

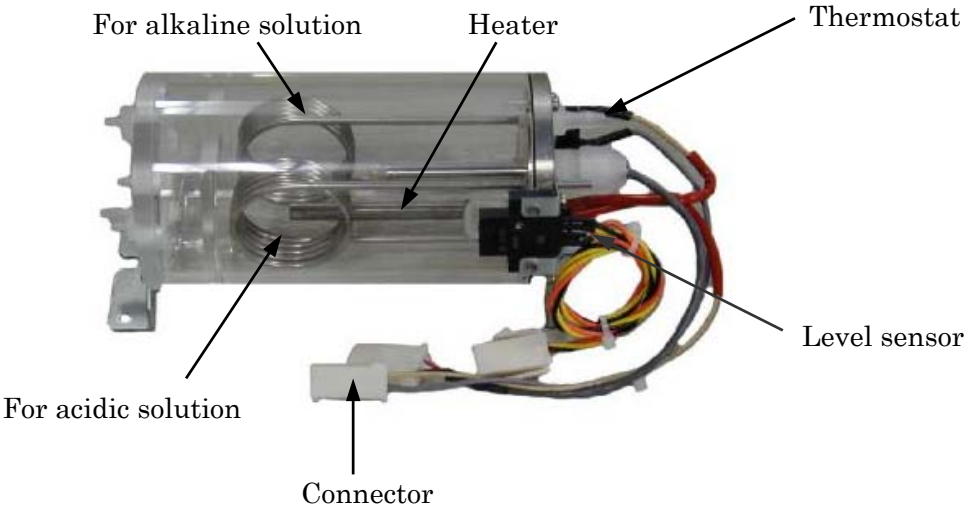


Fig. 3-77 Washing solution pre-heater

- Refer to "ASSY-15 WSH" for the unit assembly drawing.
- Refer to "Wiring-16 WSH" for the unit wiring diagram.

3.13.2. Function and Action

1. Function

This pre-heater is used for heating water (five lines), alkaline solution (one line) and acidic solution (one line) used for washing of reaction cuvettes after measurement to 37℃.

This washing water is dispended into reaction cuvettes from dispensation nozzle of reaction cuvette washing station.

2. Temperature control

The temperature of water is detected by the sensor ⑤ fixed to the center of station, and heater ④ is controlled accurately by PID control on TCD PCB.

The temperature is set a little higher than 37℃ so as to keep washing water at 37℃ when dispensing to reaction cuvettes.

As protection function, thermostat ⑩ is installed.
In case the temperature exceeds 70℃, power source will be turned OFF not to electrify to heater ④.

Moreover, to prevent heating empty lines, level sensor ⑫ is installed in order to check whether there is any water in it or not

3.13.3. Unit Dismantling and Re-assembly

1. Unit dismantling

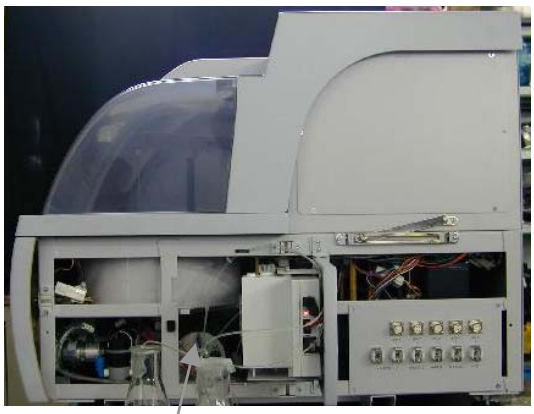


Fig. 3-78 System right side view

1. Turn off system power source and PC power switch.
2. Remove the right side panel.
3. When opening ISE door, WSH can be seen in the inner part.

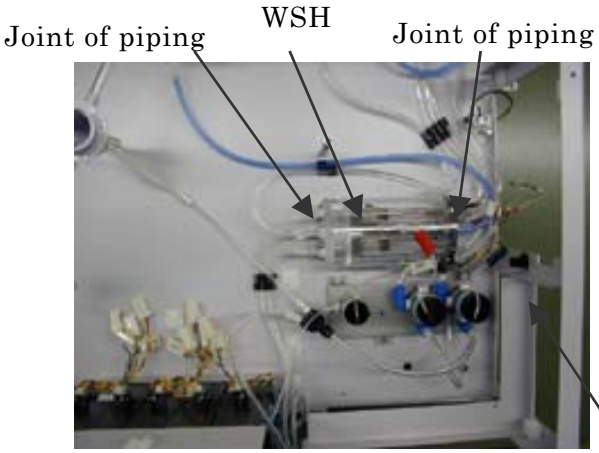


Fig. 3-79 WSH surroundings

4. Before taking out unit, empty inside of WSH.
5. Remove connectors.
   J5401 J5402 J5403
6. Remove all the piping connected to unit

Both sides of the right

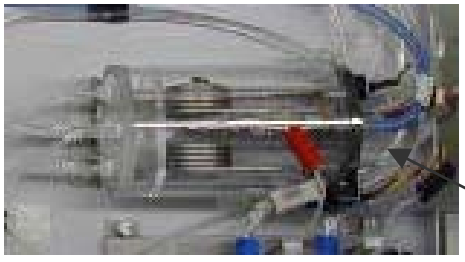


Fig.3-80 WSH

7. Loosen unit fixing screws (two) and remove them.
   Pulling out unit from ISE door, take it out.

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

Electric power should be off before the maintenance.

- If connecting or disconnecting while power is ON, electric parts may be damaged by electric shock.

When removing piping, wipe up the water flown from tube.

- If water is carried into electric parts such as sensors, they may be damaged.

3.14. Probe Washing Pump (PWP)

3.14.1. Parts and Configuration

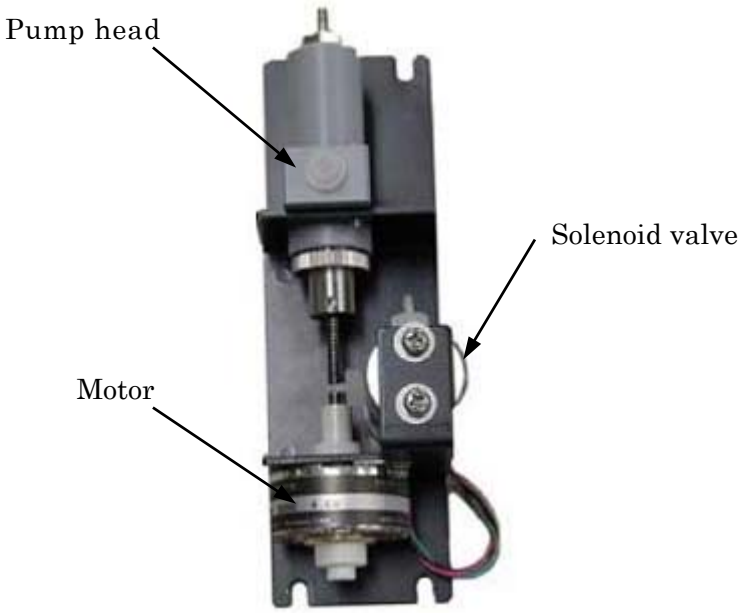


Fig. 3-81 Probe washing pump

- Refer to “ASSY-16 PWP” for the unit assembly drawing.
- Refer to “WIRING-16 PWP” for the unit wiring diagram.

3.14.2. Function and Action

1. Function

Reagent probe and sample probe aspirate reagent or sample from reagent bottle, and dispense into reaction cuvette. After finishing dispensation, both inside and outside of reagent probe or sample probe are washed by washing water in probe washing pot.
This pump provides this washing water.
The amount of the dispensation for one time is approximately 1800 μ L.

2. Action (Refer to "ASSY-16" for assembly drawing.)

The shaft of stepping motor ⑦ slides up or down when pulse is given.
This sliding motion is transferred to plunger ③.

Plungers ③ have shade pin which shade home position sensor ⑥ light at home position. This detects home position at initialization.

・ Home position is at the top. (Dispensation ending position)

At aspiration, shaft of stepping motor ⑦ goes down, and plunger also goes down.

At dispensation, shaft of stepping motor ⑦ goes up, and plunger also goes up.

If plunger will not be at the home position within the fixed time, analyzer gives an alarm and emergency stop.

3.14.3 Unit Dismantling and Re-assembly

1. Unit dismantling

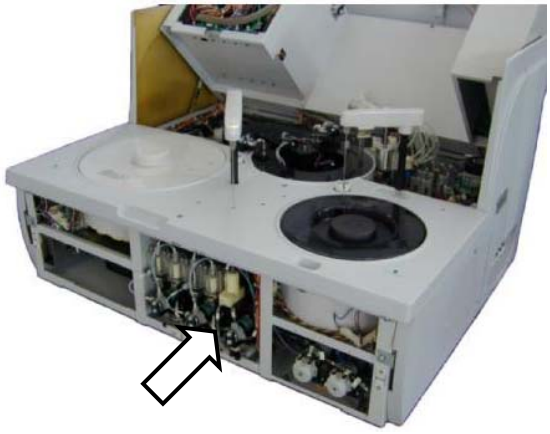


Fig. 3-84 System slant view

1. Turn off system power source and PC power switch.
2. Open top cover.
3. Remove front panel.
4. Remove piping (two) connected to solenoid valve.

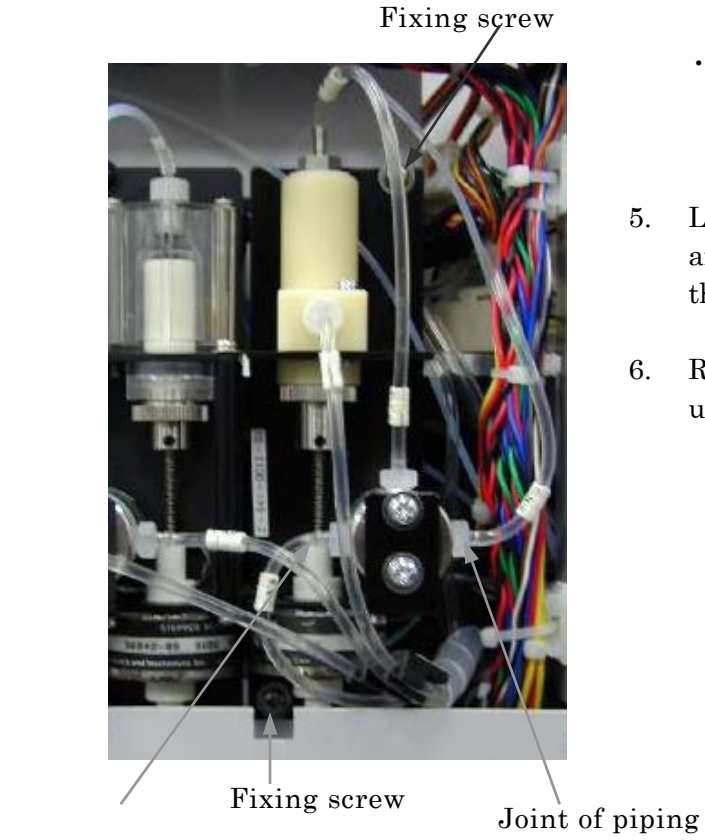


Fig. 3-85 PWP surroundings

- When disconnecting tubes, water in the tube flows out. Wipe it off with tissue paper.

5. Loosen the lower screw fixing unit, and remove the upper screw, and then remove unit.
6. Remove three connectors connected to unit.
   J5301, J5302, J5512

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

Electric power should be off before the maintenance.

- If connecting or disconnecting while power is ON, electric parts may be damaged by electric shock.

When removing piping, wipe up the water flown from tube.

- If water is carried into electric parts such as sensors, they may be damaged

3.14.5. Exchange of U-packing

Exchange of U-packing is performed by the same procedure as of sample pump (SP). So, the explanation is omitted.
Refer to page 3-13.

3.15. Waste Liquid Pump-1, 2 (DP-1, DP-2)

3.15.1. Parts and Configuration

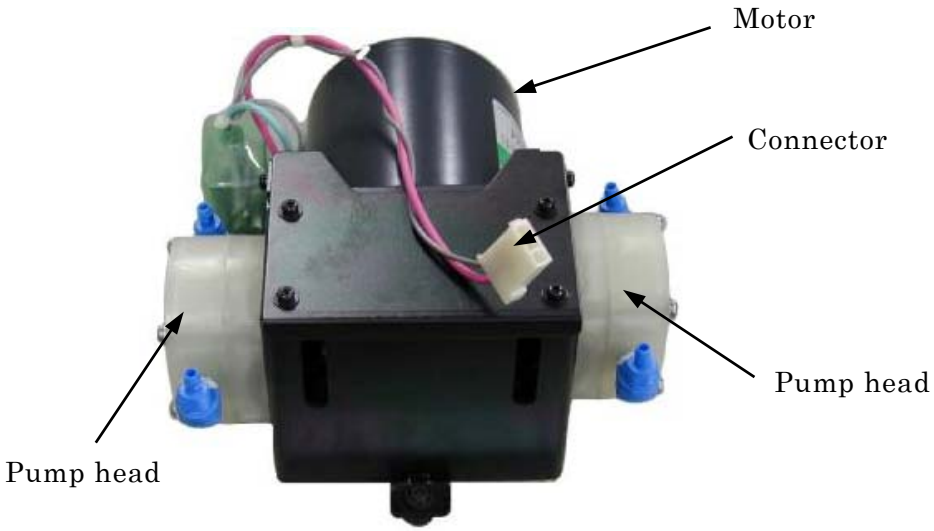


Fig. 3-87 DP-1

- Refer to "ASSY-17 DP-1, DP-2" for the unit assembly drawing.
- Refer to "WIRING-17 DP-1, DP-2" for the unit wiring diagram.

3.15.2. Function and Action

1. Function

They are the pumps that aspirate reaction liquid, reaction cuvette washing solution, and probe washing solution, etc. and discharge into waste liquid tanks located out of the system.

2. Action (Refer to "ASSY-17" for assembly drawing.)

When AC motor ③ rotates, crank ⑩ fixed to motor shaft rotates and then Diaphragm ⑦ reciprocates via bearing, etc.

When Diaphragm ⑦ moves to the motor shaft side, flap valve ⑥ on IN side opens and flap valve ⑥ on OUT side closes.
And waste liquid is aspirated from IN side into the inside of pump head.

When Diaphragm moves to the pump head side, flap valve ⑥ on IN side closes and flap valve ⑥ on OUT side opens.
And waste liquid in pump head is discharged to OUT side.

3.15.3. Unit Dismantling and Re-assembly

1. Unit dismantling

Fig. 3-88 System back view

1. Turn off system power switch and PC power switch.
2. Turn off the system main power.
3. Remove the lower rear panel.

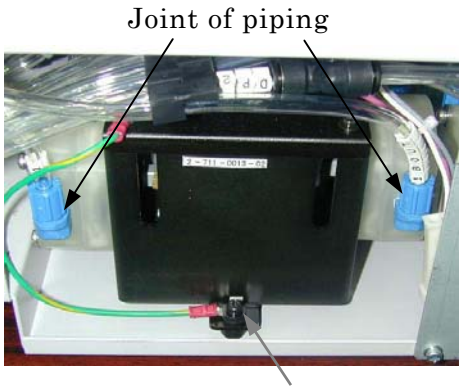


Fig. 3-89 DP-1

4. Loosen screw fixing DP-1, and take it off, and pull out DP-1 a little towards you.
5. Remove piping (four) fixed to unit.
   - When disconnecting tube, water in the tube flows out. Wipe it off with tissue paper.
6. Remove connector fixed to DP-1.
   J5501
7. Pull out DP-1 towards you to remove it.

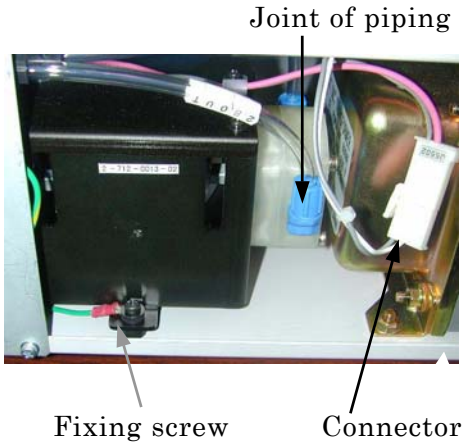


Fig. 3-90 DP-2

8. The explanation for removal of DP-2 is omitted.

   The procedure is the same as of DP-1.

2. Assembling

Assembling procedure is the reverse of the above.

3. Cautions

Electric power should be off before the maintenance.

- If connecting or disconnecting while power is ON, electric parts may be damaged by electric shock.

When removing piping, wipe up the water flown from tube.

- If water is carried into electric parts such as sensors, they may be damaged

Chapter 4 Control PCB

This chapter explains functions of control PCB and when it is broke down.

● Contents

4. 1 MCPU PCB ---------- 4-2

4. 2 SCPU PCB ---------- 4-5

4. 3 UCNT-1 PCB ---------- 4-8

4. 4 UCNT-2 PCB ---------- 4-12

4. 5 LAMP DC PCB ---------- 4-16

4. 6 PM DRV PCB ---------- 4-19

4. 7 TCD PCB ---------- 4-22

4. 8 SSRAC PCB ---------- 4-24

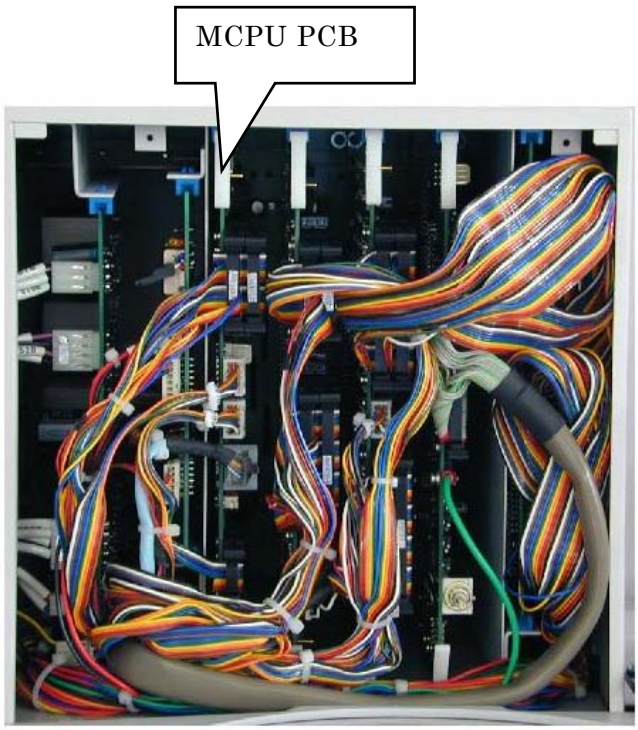
4.1. MCPU PCB

4.1.1. Outside View and Location

1. Outside view

MCPU PCB

2. Location



PCB box

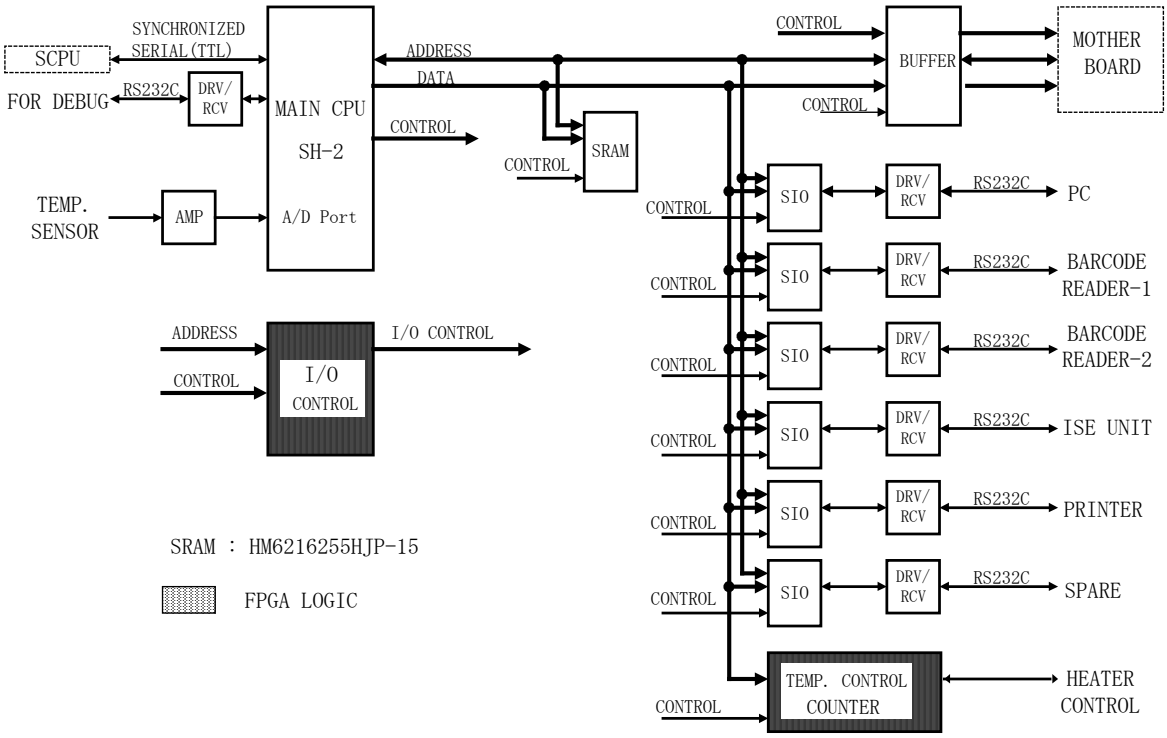
- Refer to “WIRING-18 MCPU PCB” for connecting of this board.

4.1.2. MCPU PCB Function

1. Function

Items	Contents	Notes
CPU	SH-2	HD64F7044F28
External memory	SRAM 512KB	HM6216255HJP-15
External I/O	UART 6ch Heater control	PC16552DV×3 FPGA
CPU peripheral control	Use of FPGA	EPF10K10
I/F	Mother board bus HOST PC I/F Bar code 1 I/F Bar code 2 I/F ISE unit I/F Printer I/F Spare I/F I/F for debug SCPU I/F Heater control I/F Temperature sensor I/F	CPU local bus RS232C RS232C RS232C RS232C RS232C RS232C RS232C Synchronous serial communication (master) TTL Counter pulse output Analog input
Input power	+5V +12V -12V	

2. Diagram



3. When breaking down of this board

When this board broke down, one or more of the following phenomena occur.

1. Communication error occurs between personal computer and the system.
   - Even if clicking READY button, START button and STOP button, the system won't work.
   - Dispensation of reagent or sample won't start.
   - Measuring data won't come out in the set time.

2. Communication won't be possible between sample bar code reader and the system.
   - Sample bar code reading miss or reading failure occurs.

   Note The trouble in printing or the quality of printing paper may cause sample bar code reading miss. So, check it.

   Check the code of sample bar code label. The wrong code causes sample bar code reading failure.

3. Communication won't be possible between reagent bar code reader and the system.
   - Reagent bar code reading miss or reading failure occurs.

   Note The trouble in printing or the quality of printing paper may cause reagent bar code reading misses. So, check it.

   Check the code of reagent bar code label. The wrong code causes reagent bar code reading failure.

4. Communication won't be possible between ISE unit and the system.
   - ISE correction order and measurement order won't be transmitted to ISE unit.
     Measuring data and error codes from ISE unit won't be received.

5. Communication won't be possible between printer and the system.
   - Printing will be impossible.

6. Communication won't be possible between SCPU PCB (detector) and the system.
   - Transmission of analysis items to SCPU PCB and reception of measurment data from SCPU PCB will be impossible.

7. Temperature of reaction tray (RCT) and washing solution pre-heater (WSH) cannot be controlled.

8. Breakdown of this PCB may cause abnormal movement of each unit.

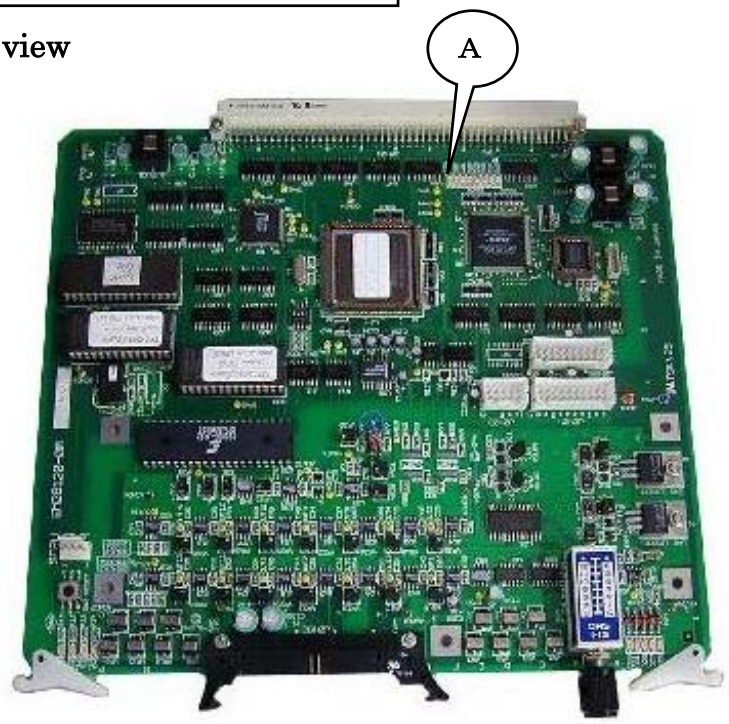
9. When LED (A in outside view) on this PCB lights up or off, this PCB is not working at all.

   Note When it is normal or only a part of it broke down, the light is blinking.

4.2. SCPU PCB

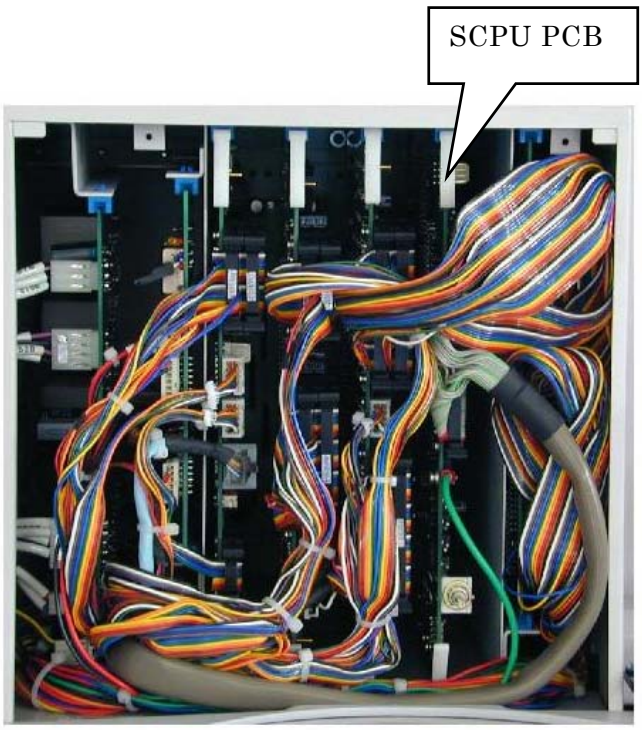
4.2.1. Outside View and Location

1. Outside view



SCPU PCB

2. Location



PCB box

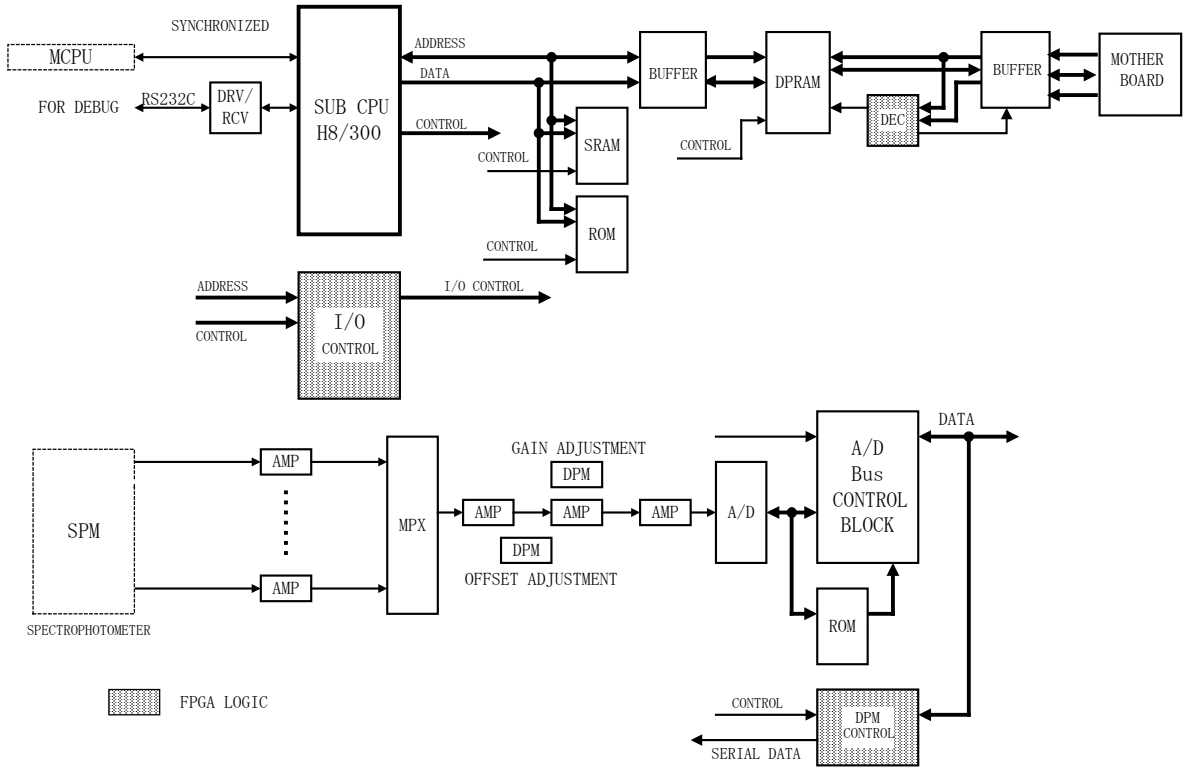
· Refer to “WIRING-19 MCPU PCB” for connecting of this board.

4.2.2. SCPU PCB Function

1. Function

Item	Contents	Notes
CPU	H8/534	HD6475348
External memory	SRAM 512KB UV-EPROM 128KB DP-RAM 32KB	HM628512BLFP-7 M27C1001-12F1 IDT7005L55PF
External I/O	A/D converter control Analog input gain control	FPGA FPGA
CPU peripheral control	Use of FPGA	EPF10K10
A/D converter	16 bits Conversion of data after A/D conversion, with ROM (log conversion)	CS5016-JP32 M27C256B-15F1×2
Analog `	14ch Possible for gain fromCPU, and offset regulation	Digital potential meter
I/F	Mother board bus MCPU I/F SPM PCB I/F	MCPU local bus Synchronous serial communication (slave) TTL Analog colorimetry signal
Input power	+5V +12V -12V	

2. Diagram



3. When breaking down of this board

When this PCB brode down, one or more of the following phenomena occur.

1. The data measured by different wavelength from the specified wavelength come out.

2. In case that auto-gain function broke down and the output voltage is over, cell blank of measurement data will be 0.0000.

3. In case that auto-gain function broke down and the output voltage is low, cell blank error C, c of measurement data will be shown.
   · Stain on cuvette causes C, c error in most of this case.

4. When LED (A in outside view) on this PCB lights up or off, this PCB is not working at all.

   Note When it is normal or only a part of it broke down, the light is blinking.

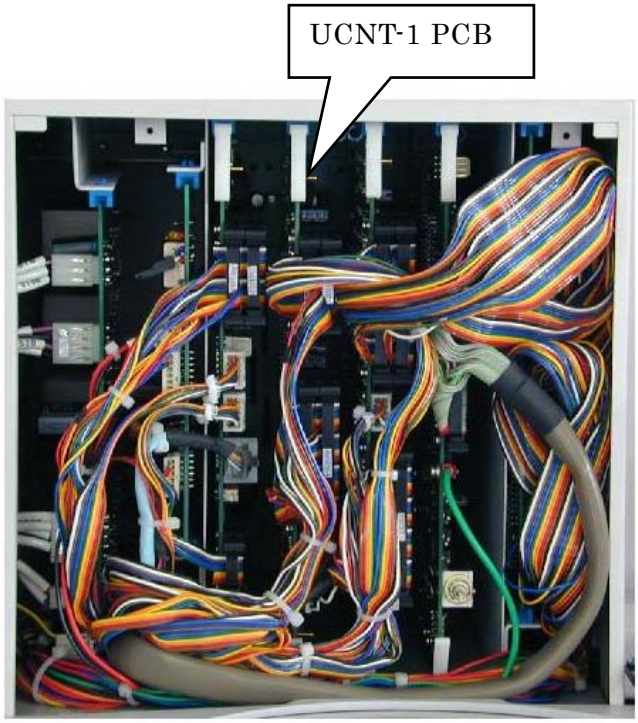
4.3. UCNT-1 PCB

4.3.1. Outside View and Location

1. Outside view

UCNT-1 PCB

2. Location



PCB box

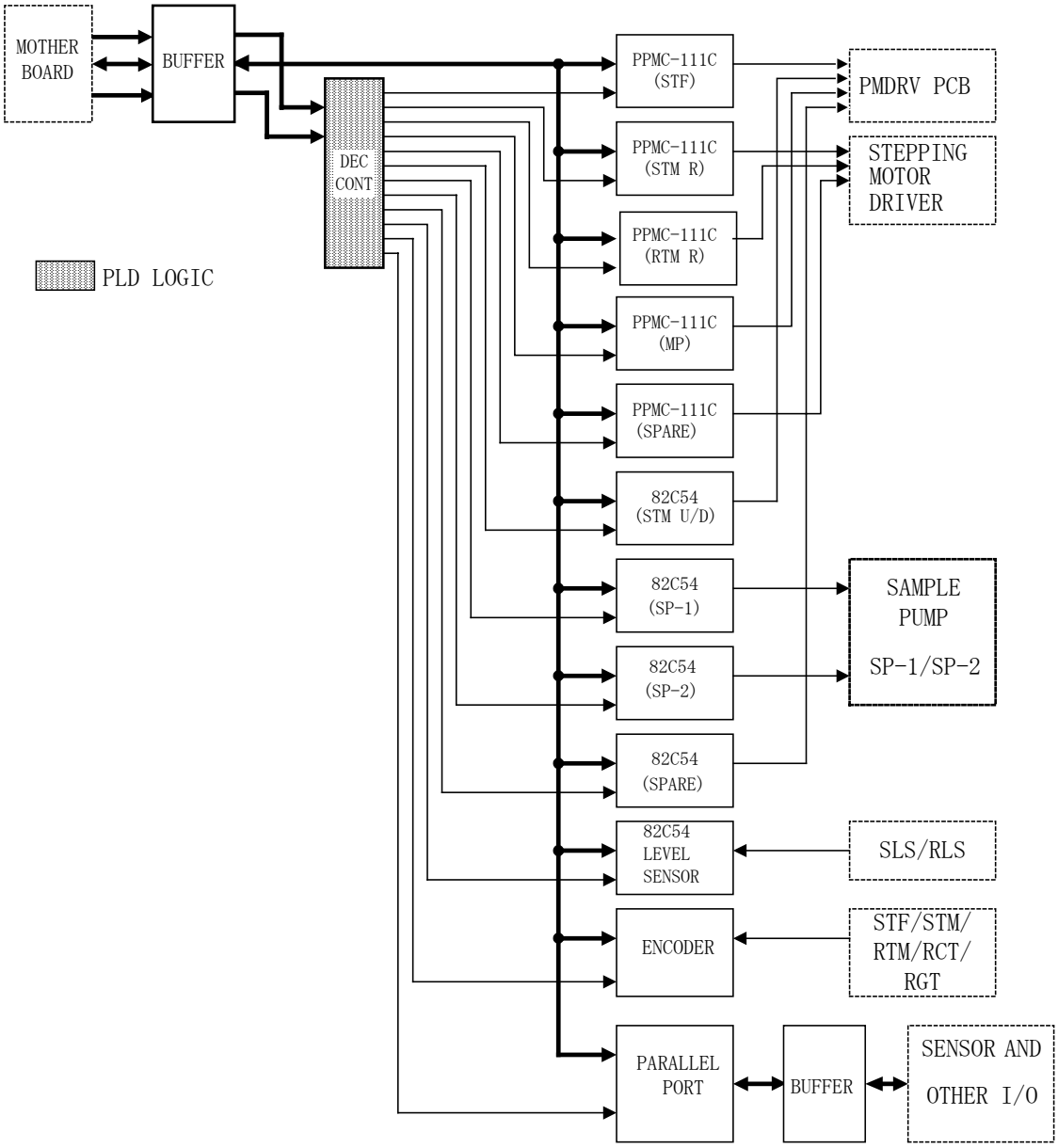
· Refer to “WIRING-20 UCNT-1 PCB” for connecting of this board.

4.3.2. UCNT-1 PCB Function

1. Function

Items	Contents	Notes
Motor control	STF (Sampler revolution) STM R (STM revolution) RCT (Reaction tray revolution) Spare 1 MP (Mixing pump) STM UD (STM Up/down) SP1 (SP washing) SP2 (SP sample) Spare 2	PPMC-111CFP PPMC-111CFP PPMC-111CFP PPMC-111CFP MSM82C54-2GS-K MSM82C54-2GS-K MSM82C54-2GS-K MSM82C54-2GS-K MSM82C54-2GS-K
Encoder pulse detection	Encoder pulse detection	ZEN2061F
Liquid level detection	Pulse count	MSM82C54-2GS-K
All kind of controls	CPLD	EPM7128S
I/F	Mother board bus Sample ID/Stop sensor I/F 5 phase/2 phase stepping motor I/F PMDRV SP1/SP2 I/F Encoder I/F Level sensor I/F	 All kind of sensors Motor control signal Motor control signal Motor control signal Encoder pulse input Level sensor signal input
Input power	+5V +12V	

2. Diagram



3. When breaking down of this board

When this PCB brode down, one or more of the following phenomena occur.

1. Sample tray (STF) motion failure occurs.

Note In case STF motor, sensor, encoder, or mother driver has trouble, STF motion failure may occur. Checking is necessary.

2. Sample tray number reading failure occurs.

   Note In case ID sensor of STF has trouble, sample tray number reading failure may occur. Checking is necessary.

3. Sample probe (STM) motion failure occurs.

   Note In case STM motor, sensor, encoder or motor driver has trouble, STM motion failure may occur.

4. Mixing pump (MP) won't rotate.

   Note In case MP motor or motor driver has trouble, MP motion failure may occur.

5. Motion failure of SP 1 (Sample pump for washing) occurs.

   Note In case SP 1 motor sensor or motor driver has trouble, SP 1 motion failure may occur.

6. Motion failure of SP 2 (Sample pump for sample) occurs.

   Note In case SP 2 motor sensor or motor driver has trouble, SP 2 motion failure may occur.

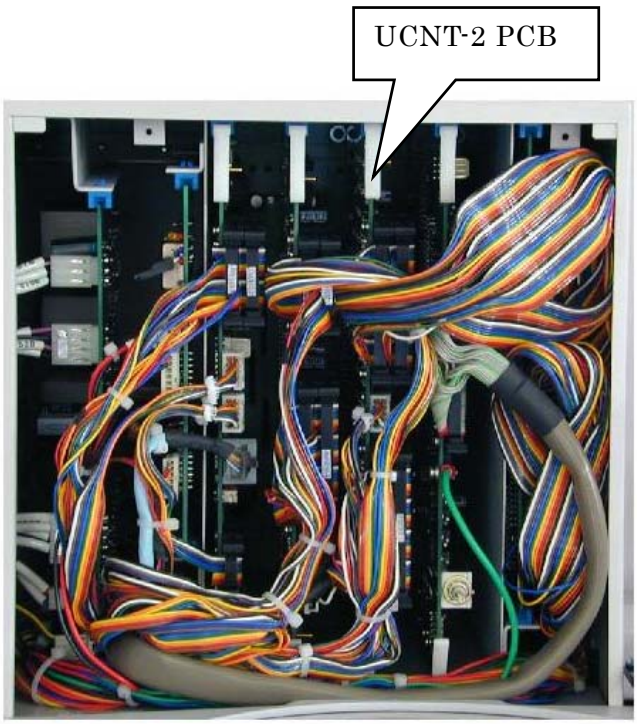
4.4. UCNT-2 PCB

4.4.1. Outside View and Location

1. Outside view

UCNT-2 PCB

2. Location



PCB box

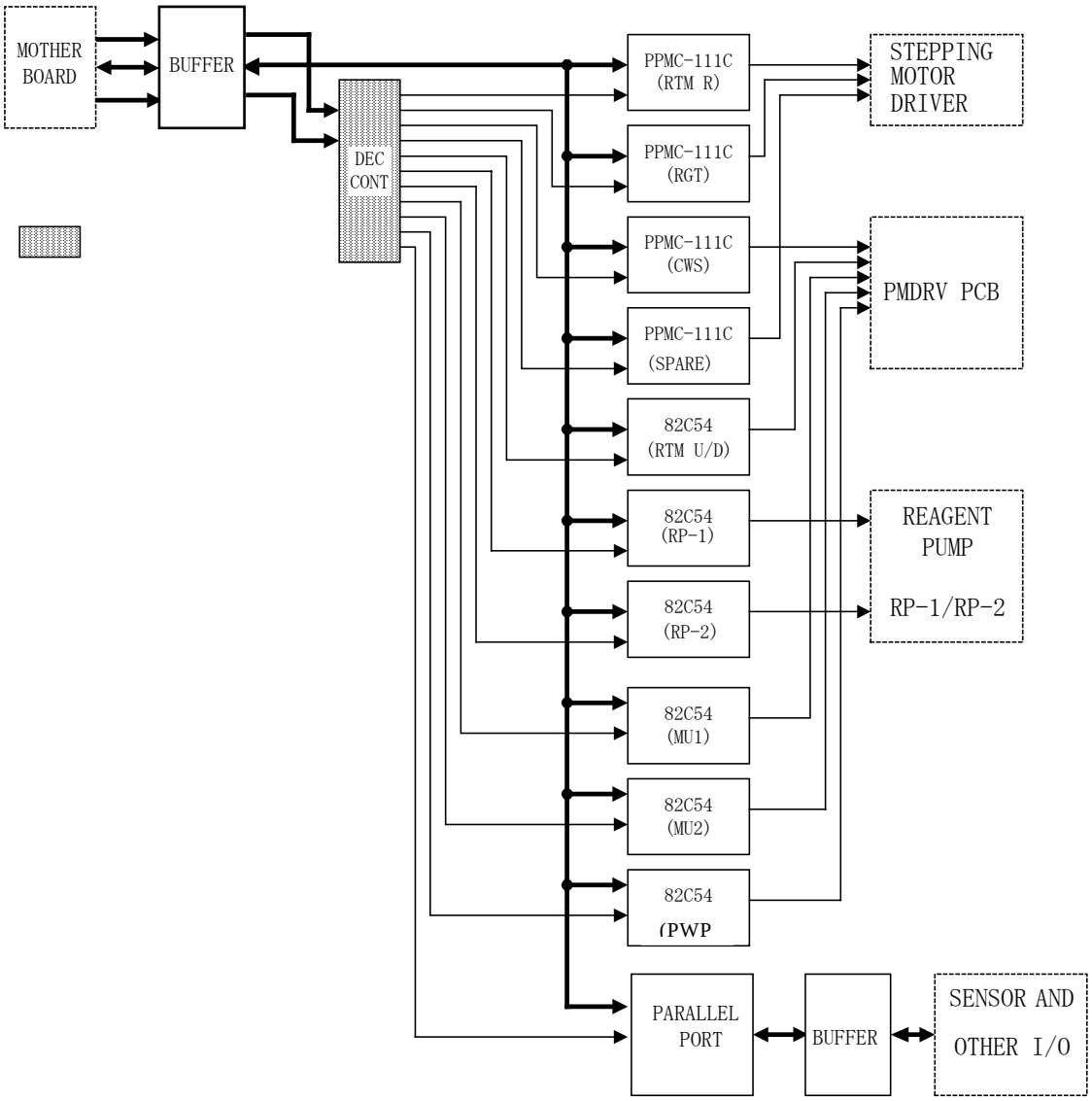
· Refer to “WIRING-21 UCNT-2 PCB” for connecting of this board.

4.4.2. UCNT-2 PCB Function

1. Function

Items	Contents	Notes
Motor control	RTM R (Reagent probe revolution) RGT (Reagent tray revolution) Spare 3 RTM-UD (Reagent probe up/down) RP1 (Reagent probe washing) RP2 (Reagent pump) CWS (Reaction cuvette washing station) MU1 (Mixing unit 1) MU2 (Mixing unit 2) PWP (Probe washing pump)	PPMC-111CFP PPMC-111CFP PPMC-111CFP MSM82C54-2GS-K MSM82C54-2GS-K MSM82C54-2GS-K MSM82C54-2GS-K MSM82C54-2GS-K MSM82C54-2GS-K MSM82C54-2GS-K
Peripheral control	CPLD	EPM7128S
I/F	Mother board bus Stop sensor I/F Switch sensor I/F 5 phase/2 phase stepping motor I/F PMDRV I/F RP1/RP2 I/F SSRAC I/F	 All kind of stop sensors All kind of switch sensors Motor control signal Motor control signal Motor control signal Parallel port
Input power	+5V	

2. Diagram



3. When breaking down of this board

When this PCB brode down, one or more of the following phenomena occur.

1. Reagent probe (RTM) motion failure occurs.

   Note In case RTM motor, sensor, encoder or five-phase motor driver has trouble, RTM motion failure may occur.

2. Reagent tray (RGT) motion failure occurs.

   Note In case RGT motor, sensor, encoder or five phase motor driver has trouble, RGT motor failure may occur.

3. Motion failure of the side for washing of reagent pump (RP 1) occurs.

   Note In case RP 1 motor, sensor or motor driver has trouble, RP 1 motion failure may occur.

4. Motion failure of the reagent side of reagent pump (RP 2) occurs.

   Note In case RP 2 motor, sensor or motor driver has trouble, RP 2 motion failure may occur.

5. Motion failure of reaction cuvette washing station (CWS) occurs.

   Note In case CWS motor, sensor or motor driver (PMDRV) has trouble, CWS motion failure may occur.

6. Mixing unit 1 (MU-1) motion failure occurs.

   Note In case MU-1 motor, sensor or motor driver (PMDRV) has trouble, MU-1 motion failure may occur.

7. Mixing unit 2 (MU-2) motion failure occurs.

   Note In case MU-2 motor, sensor or motor driver (PMDRV) has trouble, MU-1 motion failure may occur.

8. Motion failure of reaction cuvette washing pump (PWP) occurs.

   Note In case PWP motor, sensor or motor driver (SSRAC) has trouble, PWP motion failure may occur.

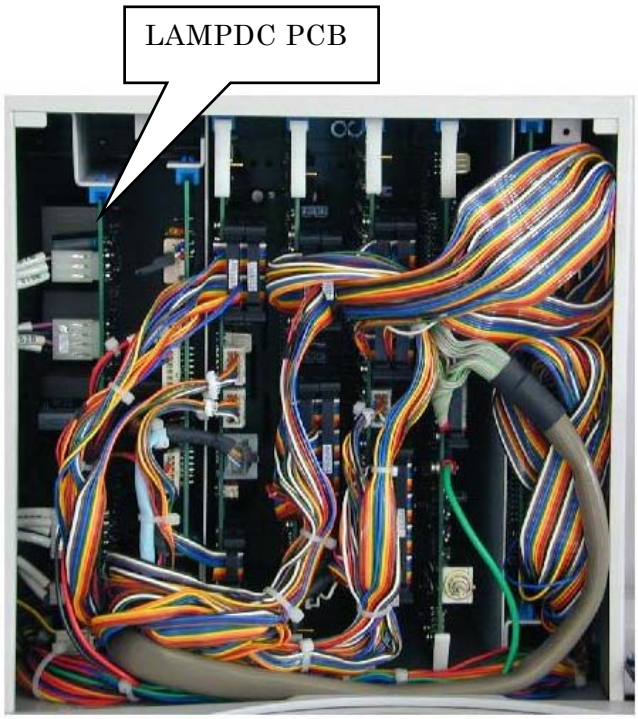
4.5. LAMPDC PCB

4.5.1. Outside view and Location

1. Outside view

LAMPDC PCB

2. Location



PCB box

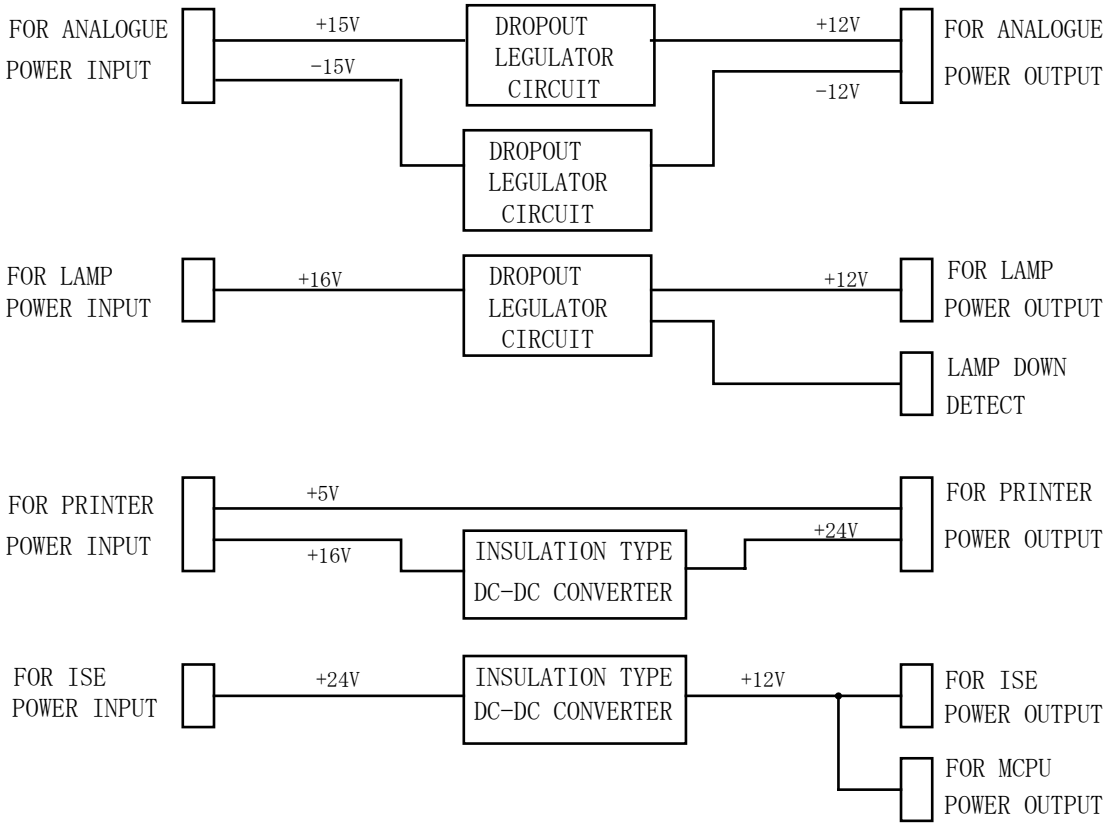
Refer to “WIRING-22 LAMPDC PCB” for connecting of this board

4.5.2. LAMPDC PCB Function

1. Function

Items	Contents	Notes
Output I/F	Analog power output Lamp detect output Lamp output LED light up output Printer power output ISE power output×2	±15V→±12V Drop out regulator circuit Photo coupler output +16V→+12V Drop out regulator circuit Insulating DC-DC converter (16V → 24V),+5V Insulating DC-DC converter (24V→12V)
Input power	+24V +16V ±15V +5V	For ISE For lamp, printer For analog output For printer
Power supply	Analog output ±12V Lamp output +12V Printer output +5V, +24V ISE output +12V	 1.7A +24V: 600mA 1A

2. Diagram



3. When breaking down of this board

When this PCB brode down, one or more of the following phenomena occur.

1. When measurement was performed with clean cuvette, the reading of cell blank becomes larger and data error mark, C, c comes out.

2. Light source lamp does not light, or gets dark.

3. Dispersion of water blank data becomes large.

4. Printer cannot perform paper feeding or cannot print.

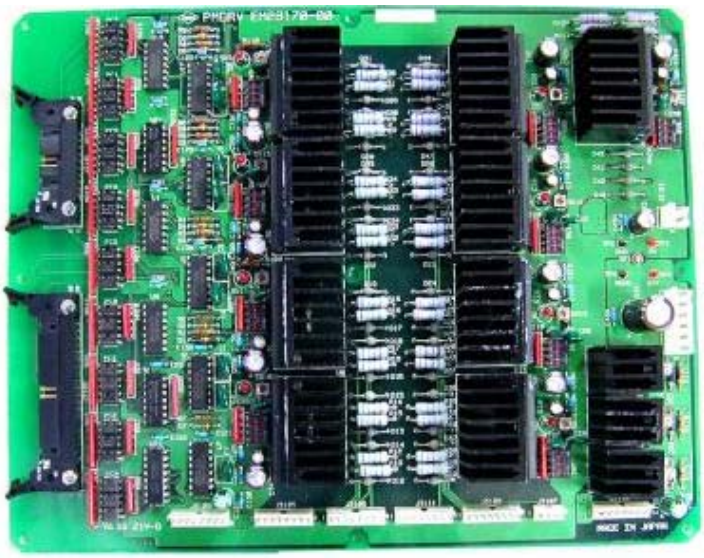
   Note In case MCPU PCB or personal computer has trouble, printing is impossible.

5. Pump of ISE unit does not rotate.

4.6. PM DRV PCB

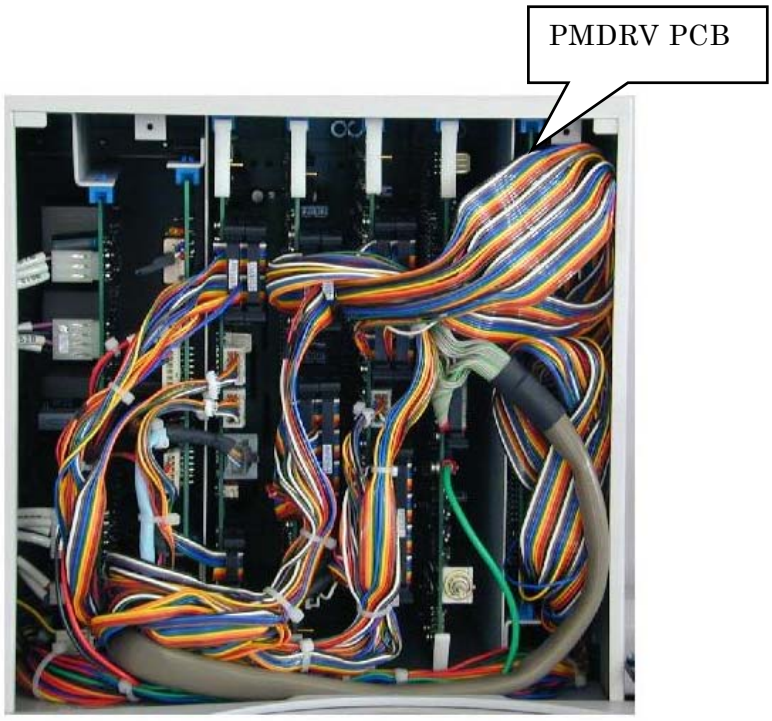
4.6.1. Outside view and Location

1. Outside view



PMDRV PCB

2. Location



PCB box

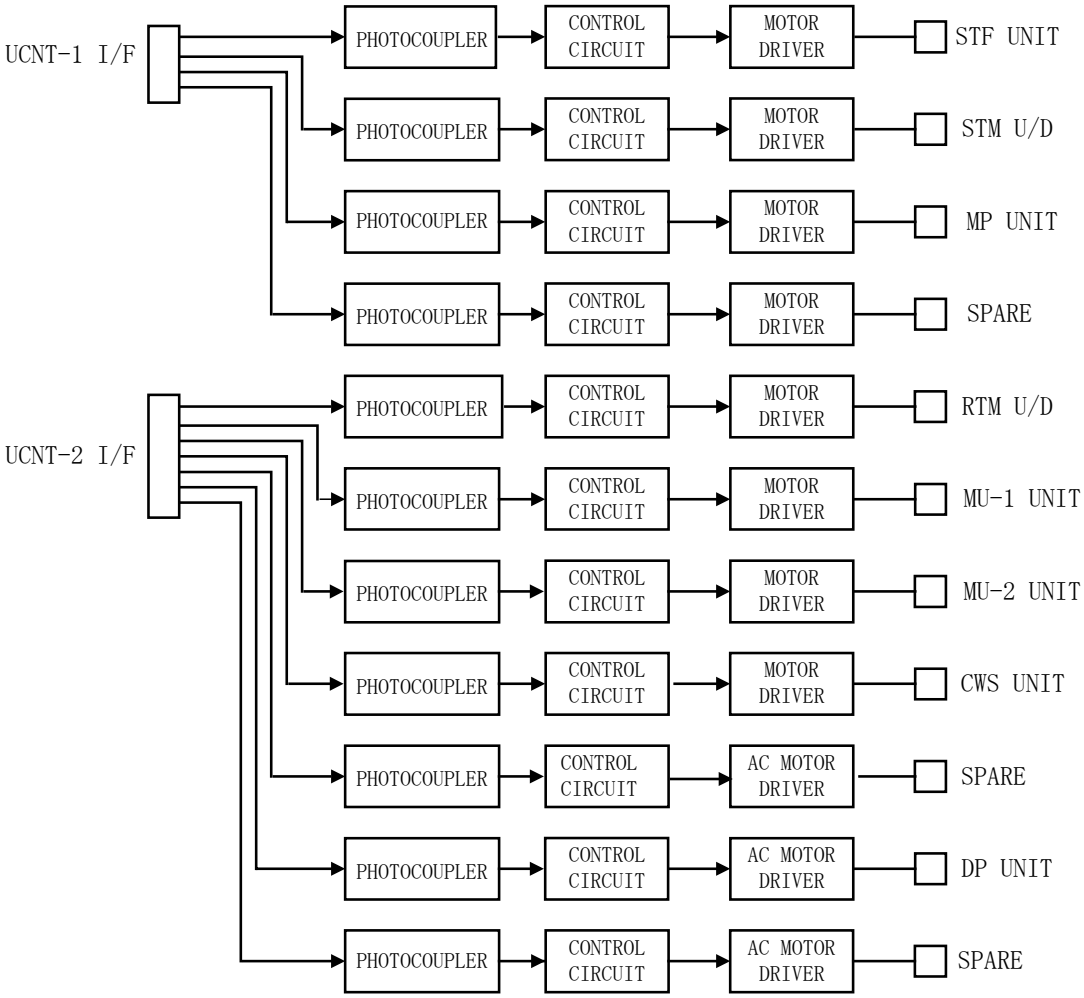
Refer to “WIRING-23 PMDRV PCB” for connecting of this board.

4.6.2. PMDRV PCB Function

1. Function

Items	Contents	Notes
Motor driver	STF : TA8534H STM UD : TA8534H MU1 : TA8534H MU2 : TA8534H RTM UD : TA8534H CWS : TA8534H MP : TA8534H Spare 1 : TA8534H Spare 2 : TA8534H	
WSD unit driver	TD62003AP	5ch
Spare driver	2SD987	3ch
Driver control signal I/F	Isolation by photo coupler	
Input power	+5V +24V	Insulating except PMDRV

2. Diagram



3. When breaking down of this board

When this PCB break down, one or more of the following phenomena occur.

1. Sample tray (STF) rotation error comes out, or rotating sound becomes louder.
2. Error comes out in up/down motion of sample probe (STM), or motion sound becomes louder.
3. Error comes out in up/down motion of mixing unit-1 (MU-1), or motion sound becomes louder.
4. Error comes out in up/down motion of mixing unit-2 (MU-2), or motion sound becomes louder.
5. Error comes out in up/down motion of reagent probe (RTM), or motion sound becomes louder.
6. Error comes out in up/down motion of reaction cuvette washing station (CWS), or motion sound becomes louder.
7. Mixing pump (MP) does not rotate, or rotating sound becomes louder.

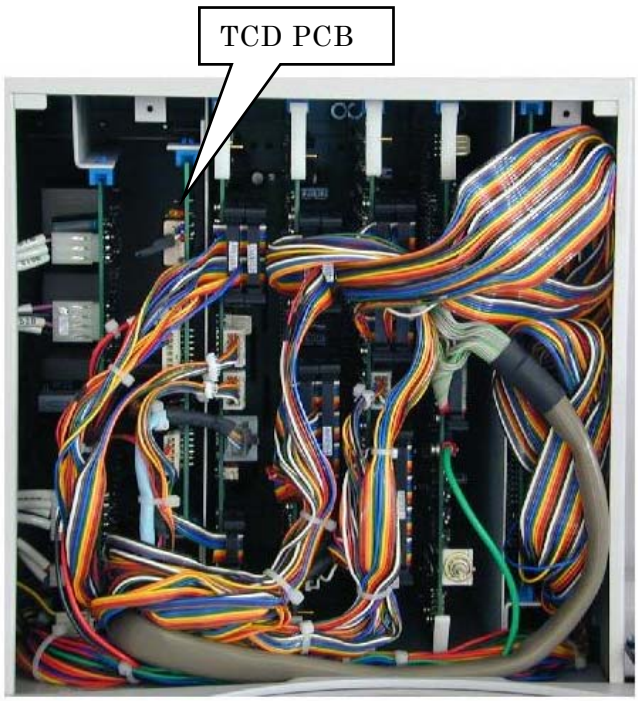
4.7. TCD PCB

4.7.1. Outside view and Location

1. Outside view

TCD PCB

2. Location



PCB box

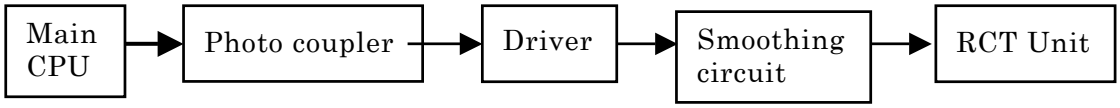
Refer to “WIRING-25 TCD PCB” for connecting of this board.

4.7.2 TCD PCB Function

1. Function

Items	Contents	Notes
Heater driver	RCT	
Driver control signal I/F	Isolation by photo coupler	
Input power	+5V +24V	

2. Diagram



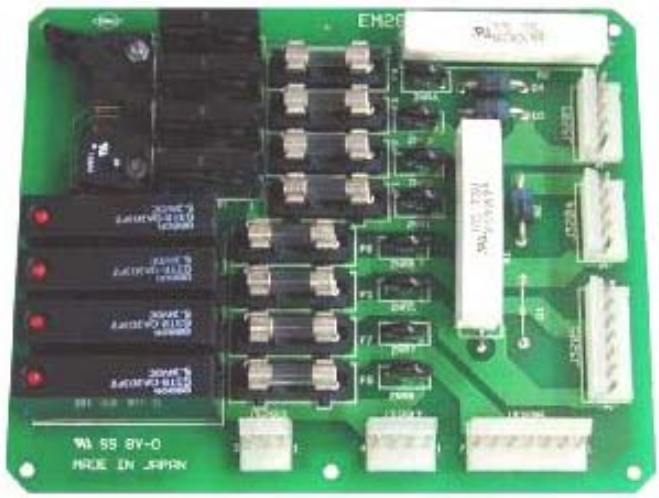
3. When breaking down of this board

The temperature of reaction tray (RCT) does not rise to the set temperature, or rises abnormally high.

4.8. SSRAC PCB

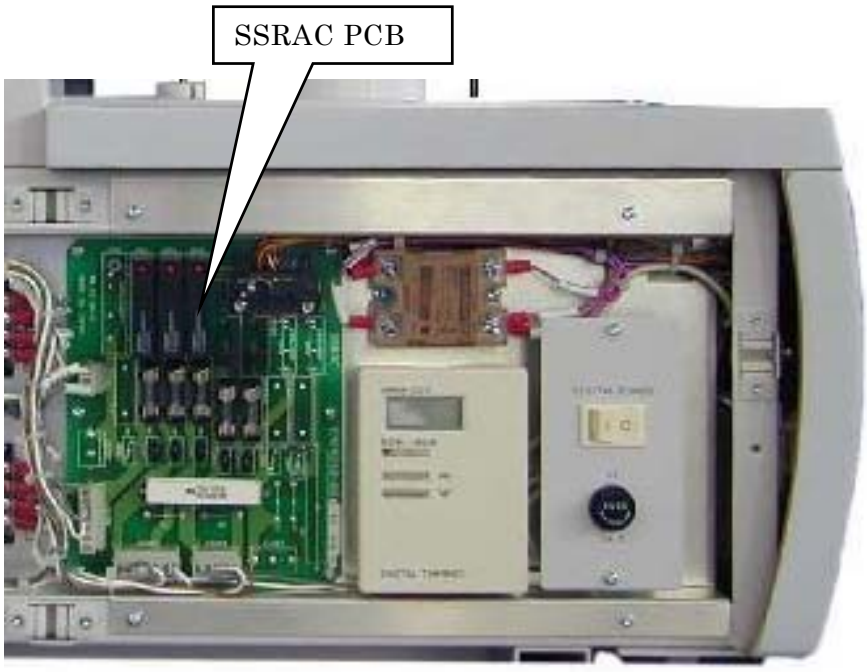
4.8.1. Outside view and Location

1. Outside view



SSRAC PCB

2. Location



System left side view

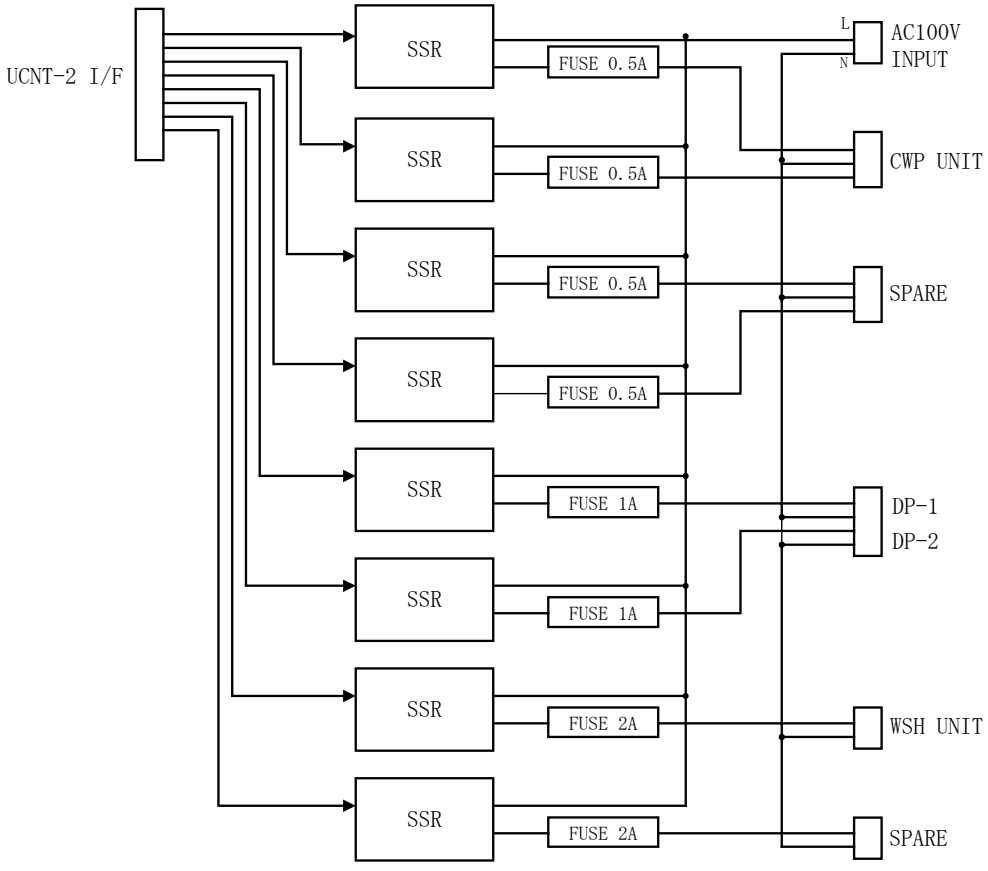
Refer to “WIRING-25　SSRA PCB” for connecting of this board.

4.8.2 SSRAC PCB Function

1. Function

Items	Contents	Notes
SSR	Spare unit : G3MB-202P DC5V×2 CWP : G3MB-202P DC5V×2 Waste liquid pump : G3TB-OA203PZ ×2 WSH : G3TB-OA203PZ Spare unit : G3TB-OA203PZ	Use of 500mA fuse for each SSR Use of 500mA fuse for each SSR Use of 1A fuse for each SSR Use of 2A fuse for SSR Use of 2A fuse for SSR
Input power	Single phase AC100V	
Supply power	Spare unit (AC motor) Normal rotation AC100V Reversing rotation AC100V CPW unit (AC motor) Normal rotation AC100V Reversing rotation AC100V Waste liquid pump unit AC100V×2 WSH unit AC100V Spare AC100V	

2. Diagram



3. When breaking down of this board

When this PCB brode down, one or more of the following phenomena occur.

1. Reaction cuvette washing pump (CWP) won't function, or won't stop functioning.
   · Washing solution does not come out from dispensation nozzle of reaction cuvette washing station (CWS), or is flowing all the time.

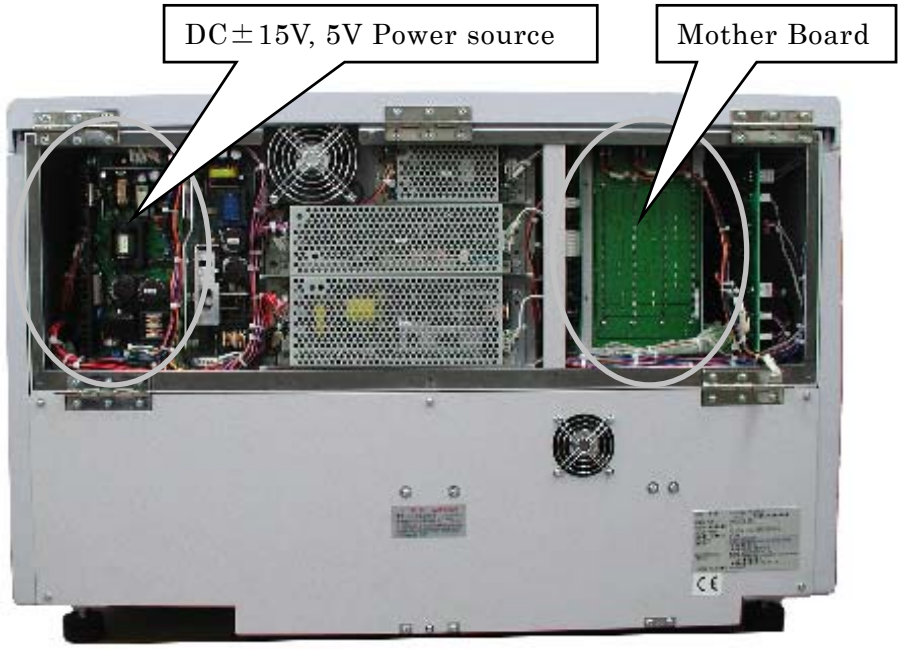
2. Waste liquid pump won't function.
   · Waste liquid is overflowed from probe washing trough.

3. The temperature of washing solution does not rise to the set temperature, or rises abnormally high.

4.9. MOTHER BOARD

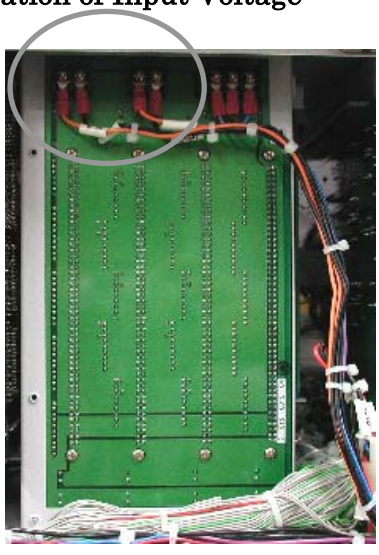
4.9.1. Unit Location and Voltage Check

1. Unit Location

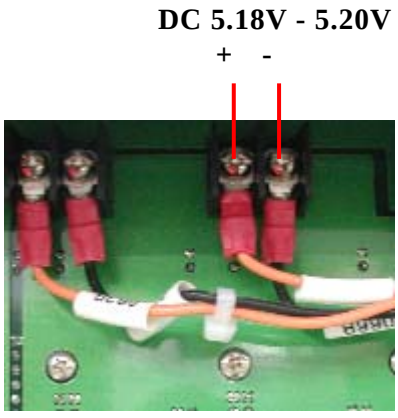


System Rear

2. Confirmation of Input Voltage



DC5V Input



Enlarged view of DC5V Input

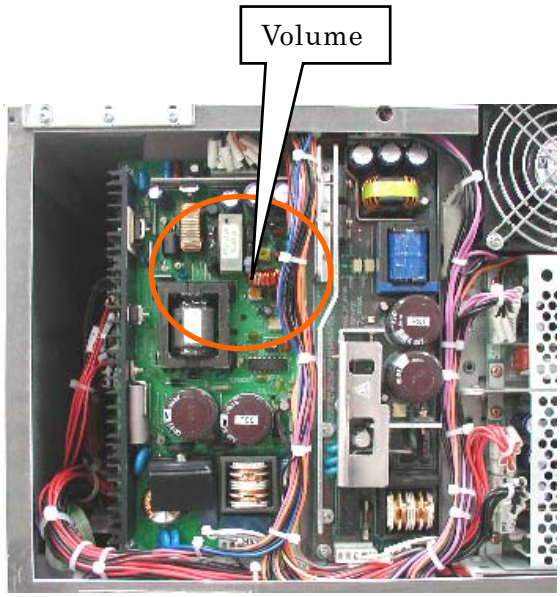
* In case the voltage is not the reference value, adjust the voltage, referring to the next page.

3. **In case that the voltage is not correctly adjusted, the following phenomenon can be seen.**

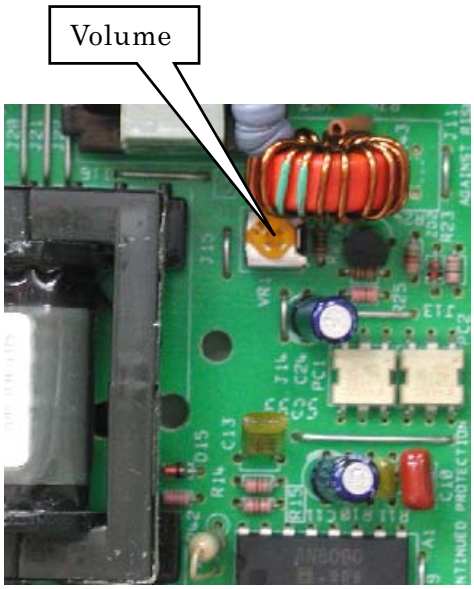
1. When the voltage is lower;
Communication with PC (Down loading) might be impossible.
Units might malfunction.

2. When the voltage is higher (higher than 5.3V);
Protection network in DC±15V, 5V power supply works, and the output voltage becomes zero.

4. **How to adjust the voltage**

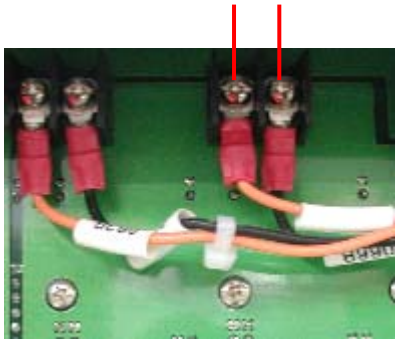


DC±15V, 5V power source



Enlarged volume part

Set the tips of digital voltmeter.



Enlarged DC5V input part

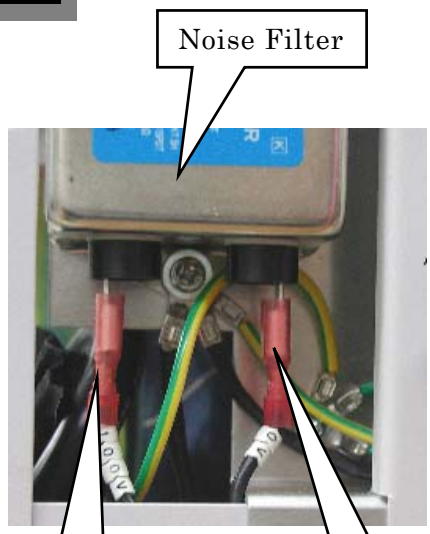
1. Set the tips of digital voltmeter to DC input terminals of Mother Board.

2. Turn the orange volume of DC±15V, 5V power sorce to adjust the voltage of DC input terminals to the range of 5.18V - 5.20V.

4.10 Shift of AC Input Voltage

Left side of System

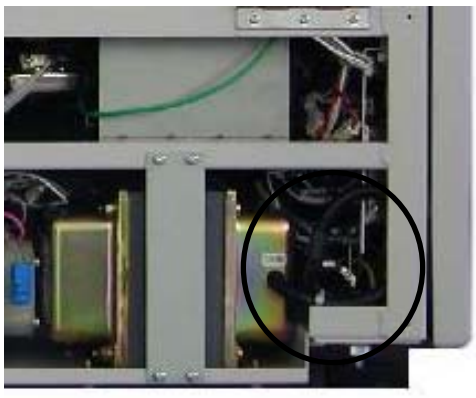
Noise Filter



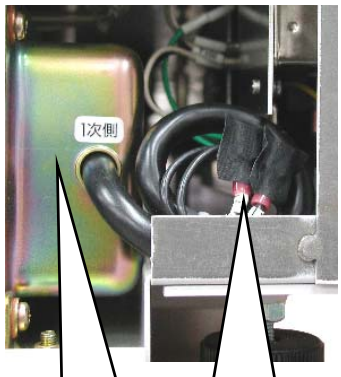
The left side terminal of noise filter is connected to AC100V or AC115V or AC230V.

Two unconnected terminals are put at the place shown below.

When it is necessary to shift the voltage, pull out the left one of the terminals which are connected, and then insert the therminal of voltage to be shifted firmly.



System Rear



Chapter 5 Hidden Screens of Maintenance

This chapter explains the hidden screens of maintenance.

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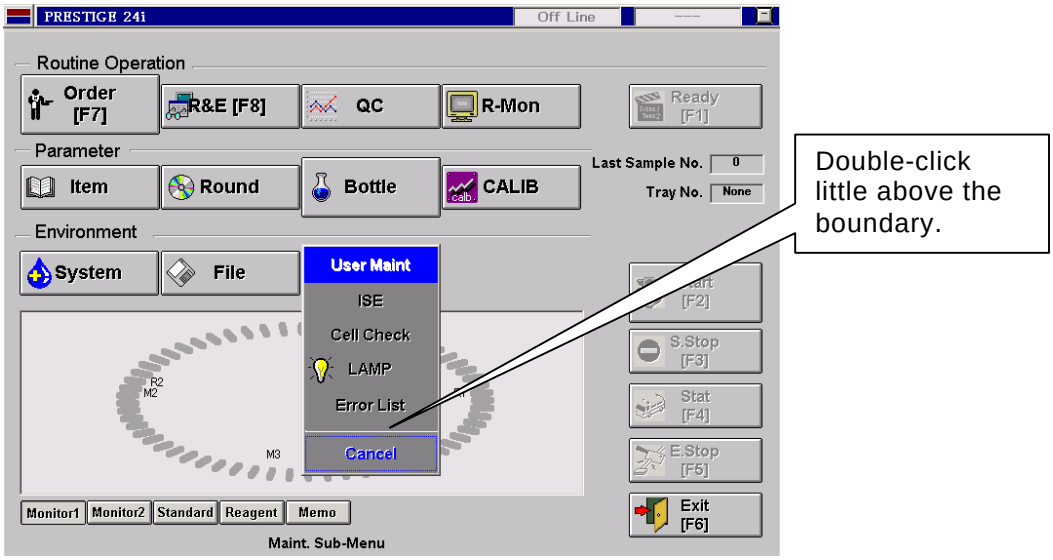
5.1 How to open the hidden screens and explanation of various screens

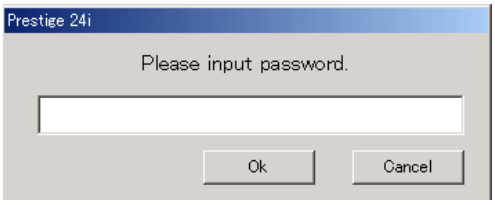
5.1.1 How to open the hidden screens

1. Click Maint. button in the Main control screen to show the sub-menu.



Maintenance sub-menu screen

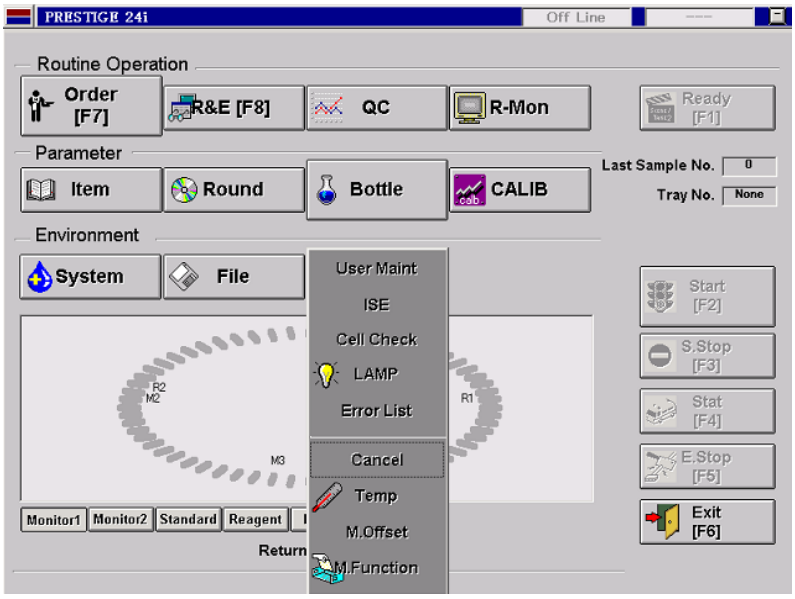
2. Move the cursor to around the boundary between Error list and Cancel of the sub-menu, and double-click.
So, the following password input box appears.



Input the password and click OK button.

After checking the input against the registered word, the enlarged menu is shown if it is identical.

Refer to Chapter 4, “4.13 Setting Password” of Operator’s Manual for setting the password.



Enlarged maintenance sub-menu screen

3. Temperature, M.Offset, and M.Function are displayed in the enlarged part of the sub-menu. Refer to the pages following 5.2 for these explanations.

5.1.2 Explanation of various screens

1. The following show the screens mentioned in the enlarged sub-menu and their functions.
   Refer to the pages following 5.2 for the details.

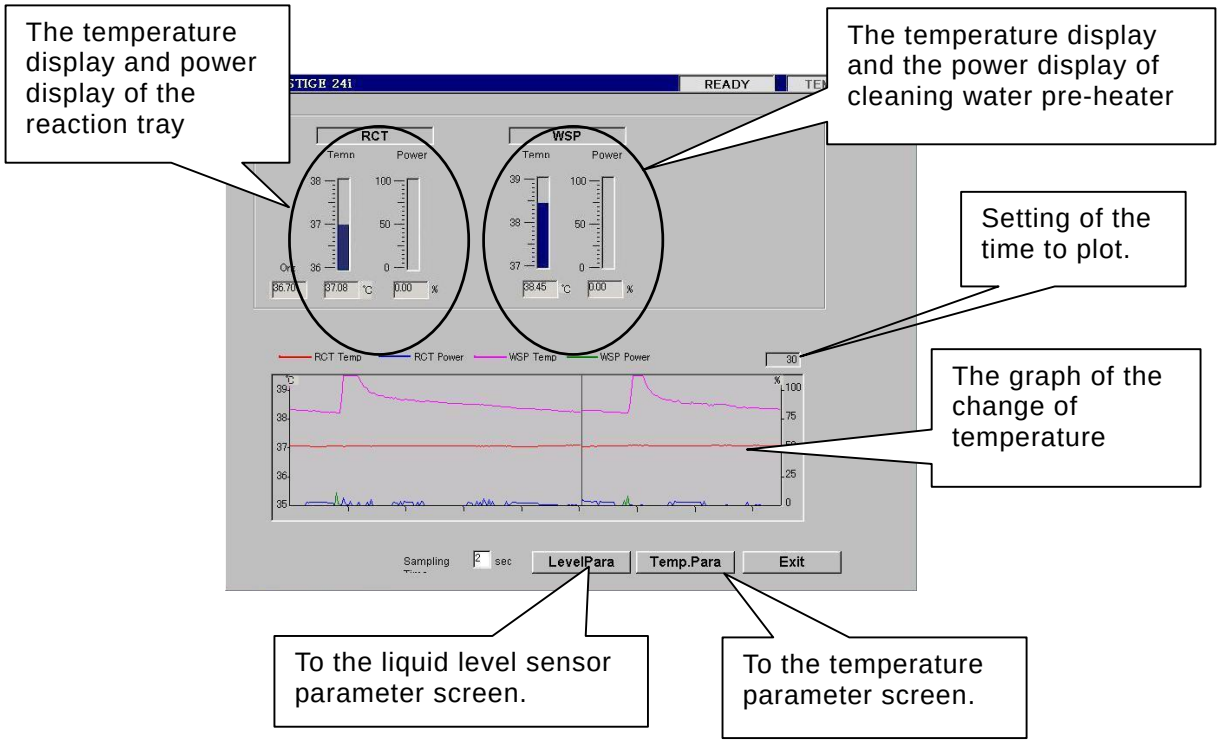
Temperature	The temperature monitor screen of the reaction tray and the pre-heater of cleaning water. There are the liquid level sensor parameter screen and the temperature parameter screen as sub-screens.
Offset	The input screen of the offset values for the unit alignment.
Manual Function	The screen to move the units by manual operation. The following are the sub-screens.

Mon	?
Encoder	The screen to see the information of encoder.
Sensor	The monitor screen of the position sensor.
Offset	The same screen as the screen of Offset above.
M.Auto	The screen to combine the manual operations to program.
Gain	The screen for the adjustment of the intensity of light.
PFBTN	?

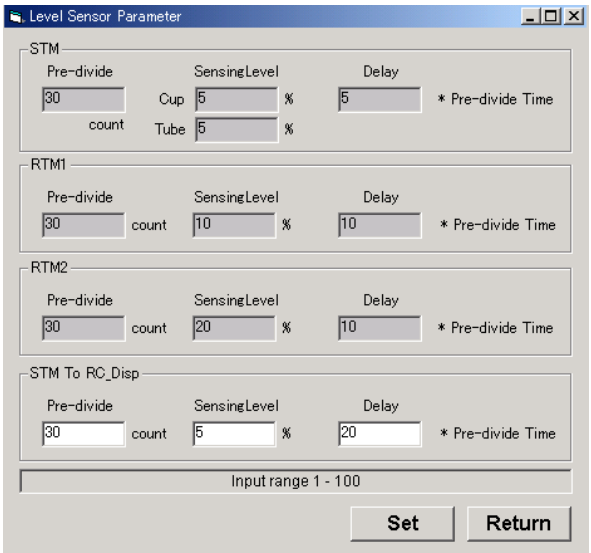
5.2 Temperature monitor screen

5.2.1 Temperature monitor screen

1. When clicking Temp. in the enlarged sub-menu of Maintenance, the following screen comes out.



2. When clicking LevelPara button in the screen, the following screen is shown.

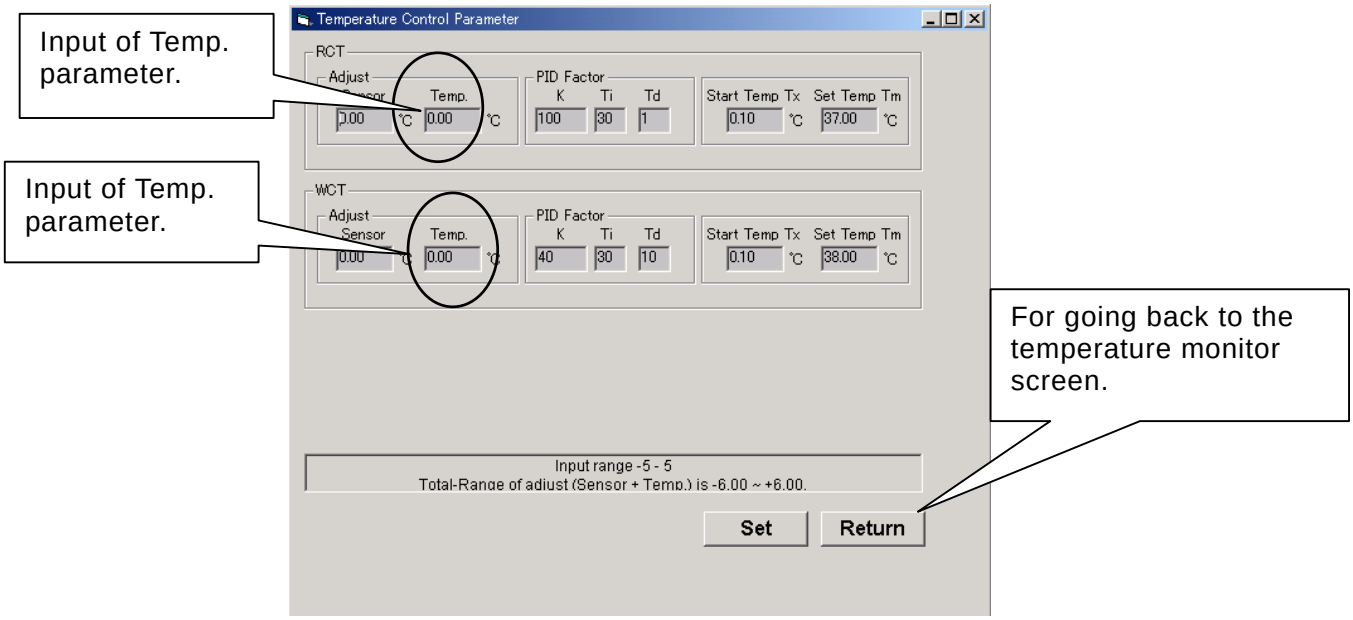


Liquid level sensor parameter screen

Caution : Be sure not to change the value of the parameter in this screen, for the optimum value is set for each on program.

3. When clicking Temp.Para button in the temperature monitor screen, the

following screen is shown.



Temperature parameter screen

Notice : Be sure to input the value in Temp. of Adjust, when setting up or exchanging the personal computer.

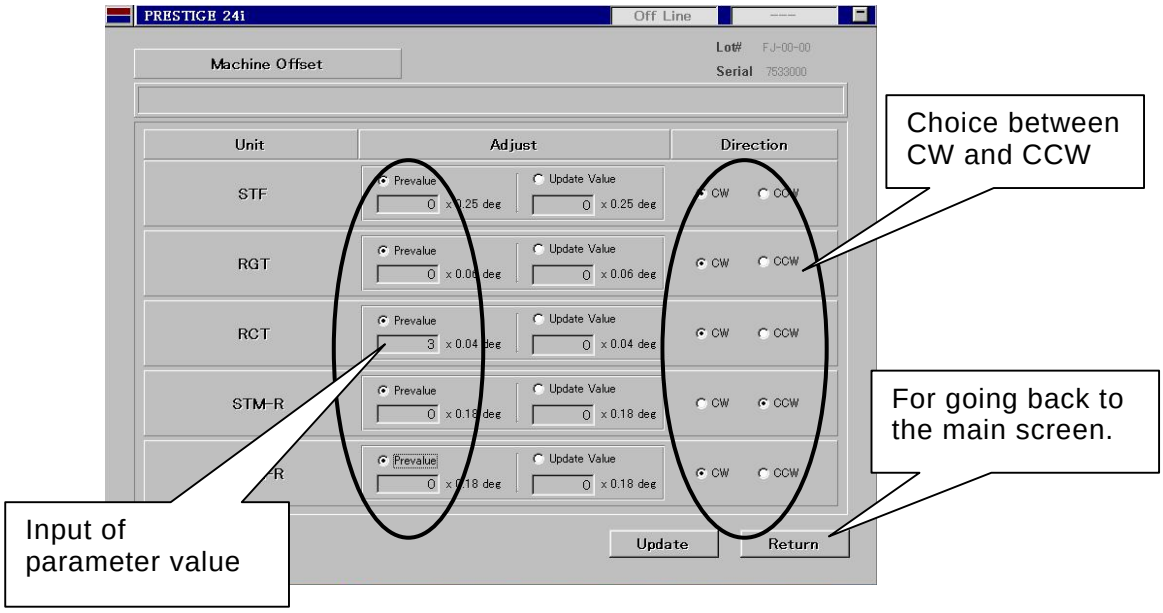
(Input the parameter value written on the back of the front panel.)

- Set no other than these parameters.
- Upon inputting the parameter value, click Set button.
- When the setting is completed, click Return button to go back to the temperature monitor screen.

5.3 Machine offset screen

1. Click M.Function in the enlarged maintenance sub-menu.
   So, the Manual Operation screen comes out.

2. When clicking Offset button in the Manual Operation screen, the following screen is shown.



Machine offset screen

Notice : Be sure to input the machine offset value and Direction, when setting up or exchanging the personal computer.

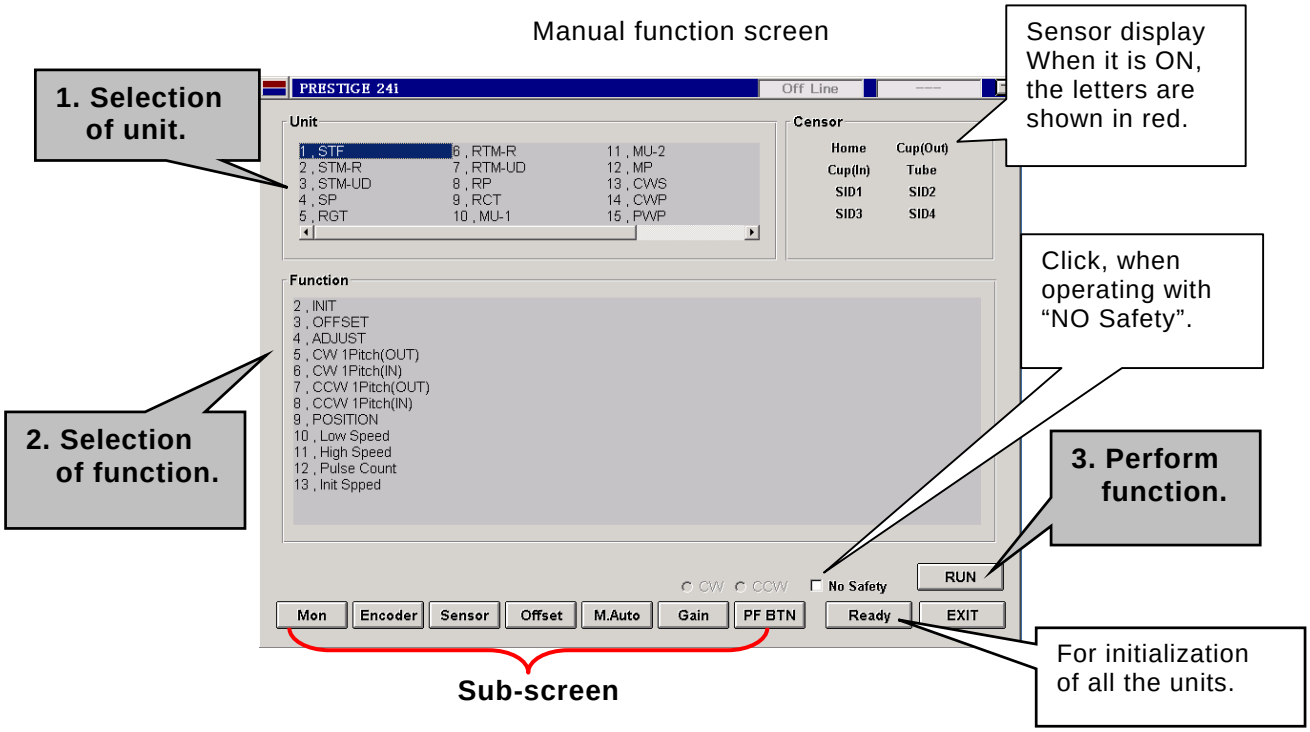
(Input the parameter values written on the back of the front panel.)

Upon inputting the parameter value, click Update button.

When the setting is completed, click Exit button to go back to the main control screen.

5.4 Outline of manual operation screen

1. When clicking [M.Function] button in the enlarged sub-menu of Maintenance, the following screen is shown.



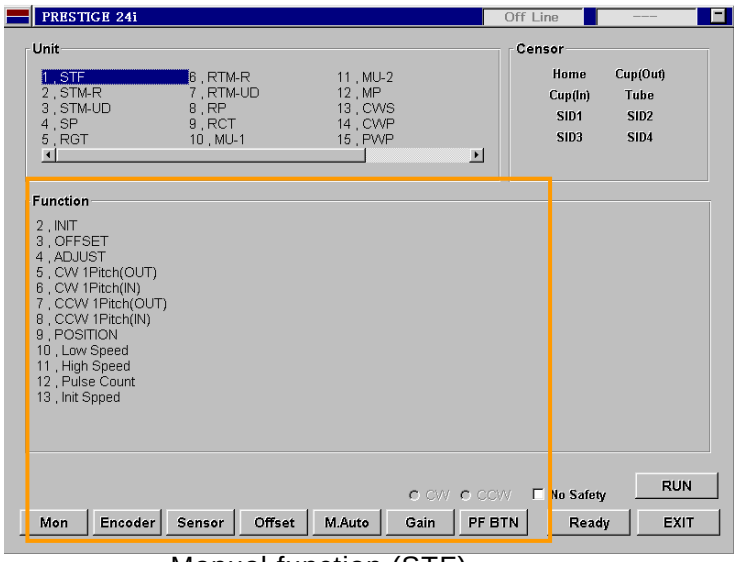
The basic procedure of manual function is as follows.

Unit → Function → RUN

Unit	(abbreviations)	(units)	(movement)
1.	STF	Sampler	Rotation of sampler
2.	STM-R	STM Rotation	Rotation of sample probe
3.	STM-UD	STM up/down	Up/Down movement of sample probe
4.	SP	Sample pump	Aspiration/Dispensation movement of sample pump
5.	RGT	Reagent tray	Rotation of reagent tray
6.	RTM-R	RTM rotation	Rotation of reagent probe
7.	RTM-UD	RTM up/down	Up/Down movement of reagent probe
8.	SP	Reagent pump	Aspiration/Dispensation movement of reagent pump
9.	RCT	Reaction tray	Rotation of reaction tray
10.	MU-1	Mixing unit-1	Up/Down movement of mixing unit-1
11.	MU-2	Mixing unit-2	Up/Down movement of mixing unit-2
12.	MP	Mixing pump	Movement of mixing pump
13.	CWS	Cuvette washing station	Up/Down movement of reaction cuvette washing station
14.	CWP	Cuvette washing pump	Aspiration/Dispensation movement of reaction cuvette washing pump
15.	PWP	Probe washing pump	Aspiration/Dispensation movement of probe washing pump
16.	DP 1/2	Drainage pump-1, 2	Movement of drainage pump-1 and 2
17.	Detector	Colorimetry detector	Not ready.
18.	TEST	?	Not ready.
19.	EVS	Electromagnetic valve monitor	Not ready

5.4.1 STF (Sampler)

1. Explanation of function



Manual function (STF)

2. INIT — To move to the home position. (And to stop when detecting the home sensor.)

3. OFFSET — To move for the corrective value set in the offset screen.

4. ADJUST — To input the angle to move by value, and to select the direction of rotation.

5. CW1Pitch(OUT) — To move the outside cups clockwise by one pitch.

6. CW1Pitch(IN) — To move the inside cups clockwise by one pitch.

7. CCW1Pitch(OUT) — To move the outside cups counter-clockwise by one pitch.

8. CCW1Pitch(IN) — To move the inside cups counter-clockwise by one pitch.

9. POSITION

10. Low Speed — ★ Starting pulse rate

11. High Speed — ★ The highest speed pulse rate

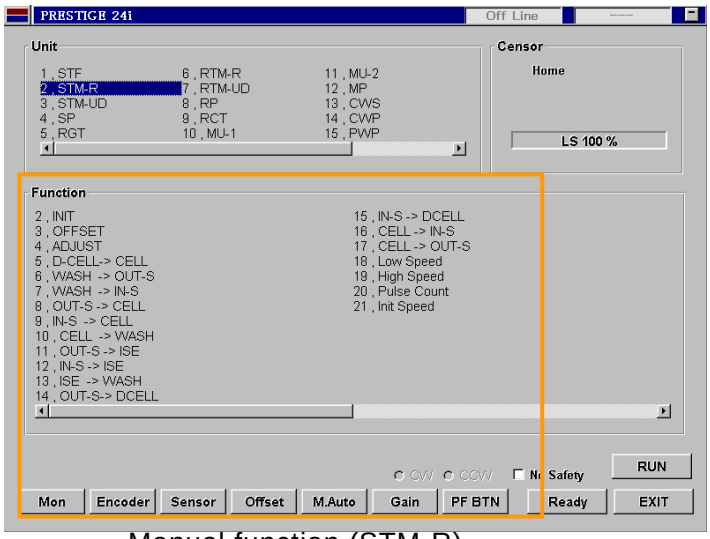
12. Pulse Count — ★ Adjustable speed pulse count

13. Init Speed — ★ Pulse rate of initialization

★ shows that setting is not needed.

5.4.2 STM-R (Sample probe - rotation)

1. Explanation of function



Manual function (STM-R)

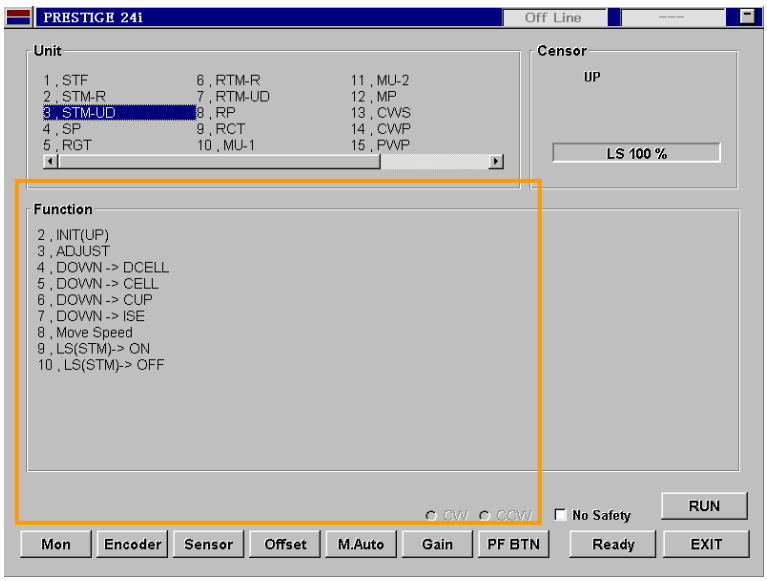
2. INIT	To move to the home position. (And to stop when detecting the home sensor.)
3. OFFSET	To move for the corrective value set in the offset screen.
4. ADJUST	To input the angle to move by value, and to select the direction of rotation.

5. D-CELL -> CELL	To move from the reaction cuvette (dilution position) to the reaction cuvette.
6. WASH -> OUT-S	To move from the washing trough to the outside sample cup.
7. WASH -> IN-S	To move from the washing trough to the inside sample cup.
8. OUT-S -> CELL	To move from the outside sample cup to the reaction cuvette.
9. IN-S -> CELL	To move from the inside sample cup to the reaction cuvette.
10. CELL -> WASH	To move from the reaction cuvette to the washing trough.
11. OUT-S -> ISE	To move from the outside sample cup to ISE.
12. IN-S -> ISE	To move from the inside sample cup to ISE.
13. ISE -> WASH	To move from ISE to the washing trough.
14. OUT-S -> DCELL	To move from the outside sample cup to the reaction cuvette (dilution position).
15. IN-S -> DCELL	To move from the inside sample cup to the reaction cuvette (dilution position).
16. CELL -> IN-S	To move from the reaction cuvette to the inside sample cup.
17. CELL -> OUT-S	To move from the reaction cuvette to the outside sample cup.
18. Low Speed	★ Starting pulse rate
19. High Speed	★ The highest speed pulse rate
20. Pulse Count	★ Adjustable speed pulse count
21. Init Speed	★ Pulse rate of initialization

★ shows that setting is not needed.

5.4.3 STM-UD (Sample probe - up/down)

1. Explanation of function



Manual function (STM – UD)

2. INIT — To move to the home position (Up position).

3. ADJUST — To input the distance by the value and select the direction of movement.

CW means Up, and CCW means Down.

4. DOWN -> DCELL — To move from the down position to the reaction cuvette (dilution position).

5. DOWN -> CELL — To move from the down position to the reaction cuvette.

6. DOWN -> CUP — To move from the down position to the inside or outside sample cup.

7. DOWN -> ISE — To move from the down position to ISE.

8. Move Speed — ★ Move speed pulse rate

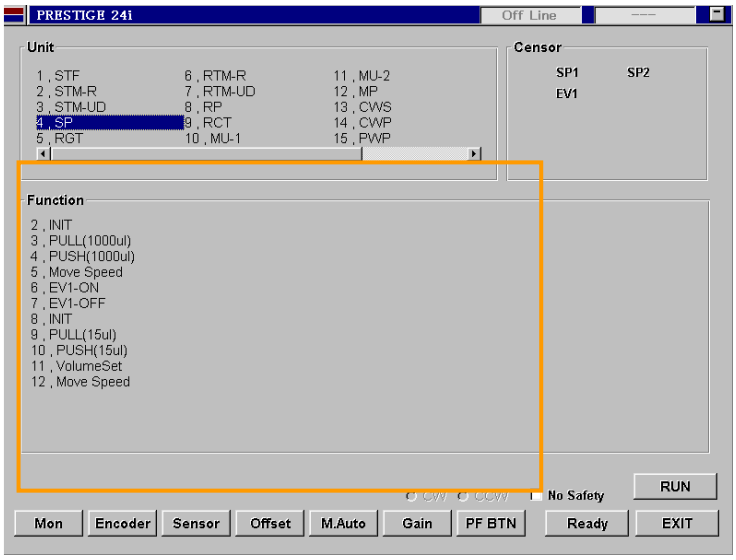
9. LS(STM) -> ON — The liquid level sensor is turned ON.

10. LS(STM) -> OFF — The liquid level sensor is turned OFF.

★ shows that setting is not needed.

5.4.4 SP (Sample pump)

1. Explanation of function



Manual function (SP)

2. INIT — The washing side of pump : To move to the home position (the upper limit).
3. PULL(1000uL) — The washing side of pump : Aspiration movement (1000uL).
4. PUSH(1000uL) — The washing side of pump : Dispensation movement (1000uL).
5. Move Speed — The washing side of pump : ★ Move speed pulse rate
6. EV1-ON — Electromagnetic valve EV-1 ON Line switch to the probe side.
7. EV1-OFF — Electromagnetic valve EV-1 OFF Line switch to the water tank.
8. INIT — The sample side of pump : to move to the home position (the upper limit).
9. PULL(15uL) — The sample side of pump : Aspiration movement (15uL)
10. PUSH(15uL) — The sample side of pump : Dispensation movement (15uL)
11. Volume Set — The sample side of pump : Setting of the amount of sample for aspiration / dispensation.

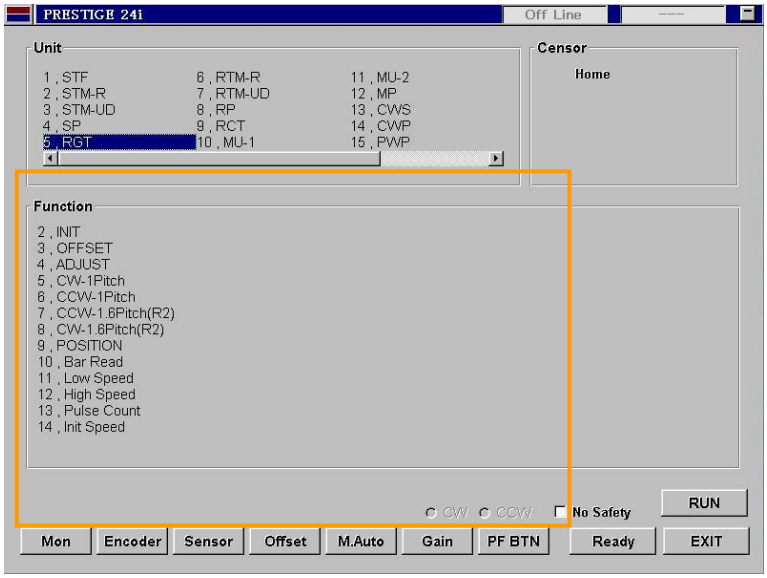
CW means Dispensation, and CCW means Aspiration.

12. Move Speed — The sample side of pump : ★ Move speed pulse rate

★ shows that setting is not needed.

5.4.5 RGT (Reagent tray)

1. Explanation of function



Manual function (RGT)

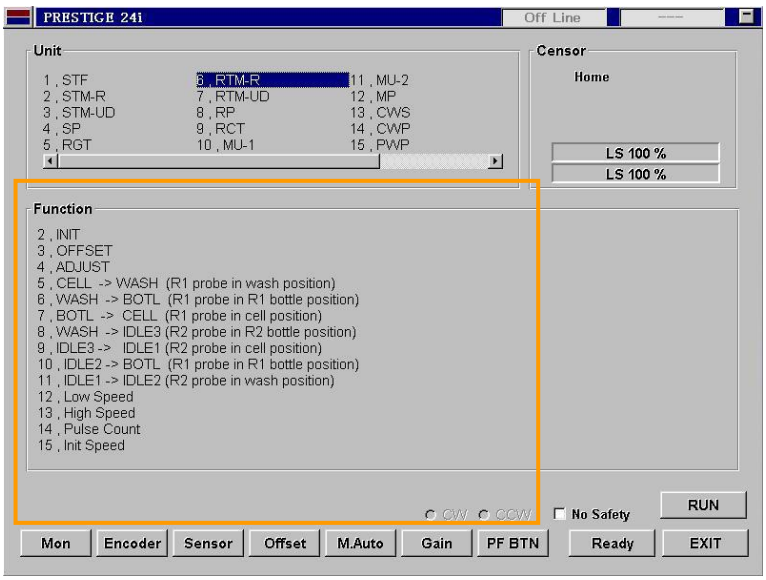
2. INIT — To move to the home position. (And to stop when detecting the home sensor.)
3. OFFSET — To move for the corrective value set in the offset screen.
4. ADJUST — To input the angle to move by value, and select the direction of rotation.

5. CW-1Pitch — To move clockwise by one bottle.
6. CCW-1Pitch — To move counter-clockwise by one bottle.
7. CCW-1.6(BOTL12) — To move counter-clockwise to R2 aspiration position.
8. CW-1.6(BOTL1) — To move clockwise from R2 aspiration position to the basic position.
9. POSITION
10. Low Speed — ★ Starting pulse rate
11. High Speed — ★ The highest speed pulse rate
12. Pulse Count — ★ Adjustable speed pulse count
13. Init Speed — ★ Pulse rate of initialization

★ shows that setting is not needed.

5.4.6 RTM - R (Reagent probe - rotation)

1. Explanation of function



Manual function (RTM – R)

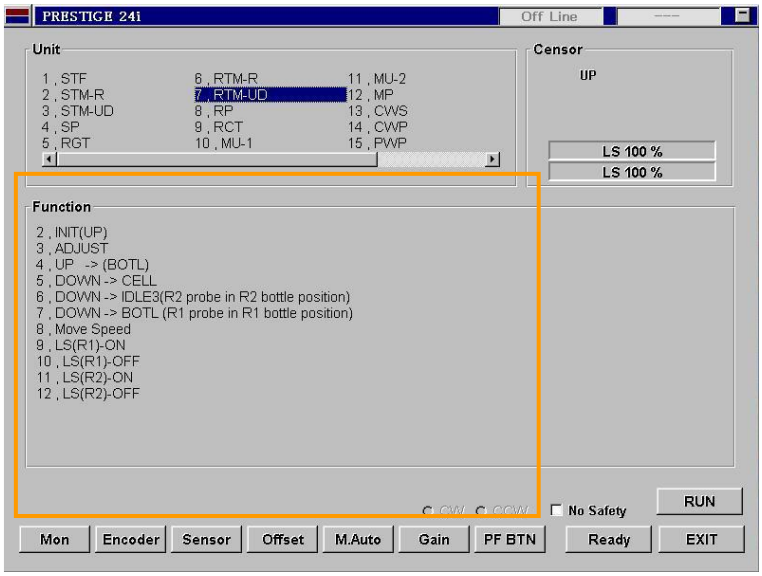
2. INIT — To move to the home position. (And to stop when detecting the home sensor.)
3. OFFSET — To move for the corrective value set in the offset screen.
4. ADJUST — To input the angle to move by value, and select the direction of rotation.

5. CELL -> WASH — To move R1 probe from the reaction cuvette to the washing trough.
6. WASH -> BOTL — To move R1 probe from the washing trough to the bottle 1 (R1).
7. BOTL -> CELL — To move R1 probe from the bottle 1 to the reaction cuvette.
8. WASH -> IDLE3 — To move R2 probe to R2 bottle position.
9. IDLE3 -> IDLE1 — To move R2 probe to the reaction cuvette.
10. IDLE2 -> BOTL — To move R1 probe to the bottle 1 position.
11. IDLE1 -> IDLE2 — To move R1 probe to the washing trough.
12. Low Speed — ★ Starting pulse rate
13. High Speed — ★ The highest speed pulse rate
14. Pulse Count — ★ Adjustable speed pulse count
15. Init Speed — ★ Pulse rate of initialization

★ shows that setting is needed.

5.4.7 RTM - UD (Reagent probe - up/down)

1. Explanation of function



Manual function (RTM-UD)

2. INIT — To move to the home position (Up position).

3. ADJUST — To input the distance by the value and select the direction of movement.

CW means Up, and CCW means Down.

4. UP -> (BOTL) — To move from Up to the bottle position.

5. DOWN -> CELL — To move from Down to the reaction cuvette

.

6. DOWN -> IDLE3 — To move R2 probe from Down to R2 bottle position.

7. DOWN -> BOTL — To move R1 probe from Down to R1 bottle position.

8. Move Speed — ★ Move speed pulse rate

9. LS(R1) - ON — The liquid level sensor of R1 side is turned ON.

10. LS(R1) - OFF — The liquid level sensor of R1 side is turned OFF.

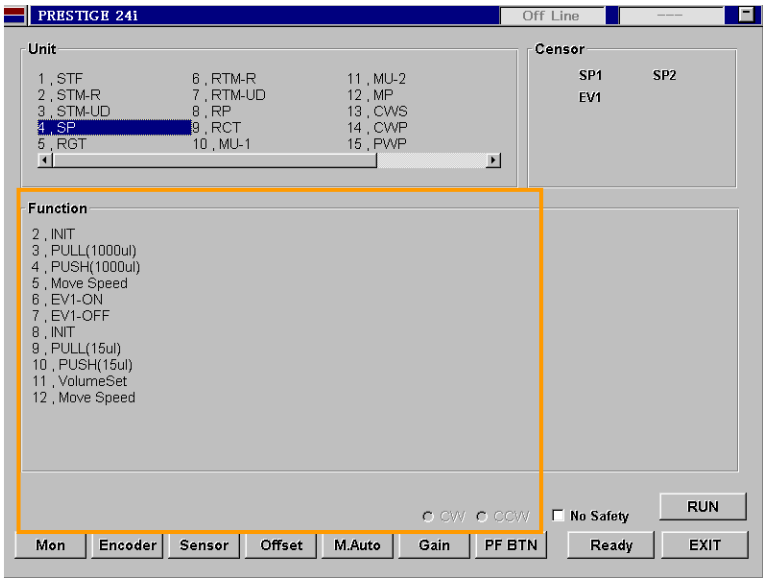
11. LS(R2) - ON — The liquid level sensor of R2 side is turned ON.

12. LS(R2) - OFF — The liquid level sensor of R2 side is turned OFF.

★ shows that setting is not needed.

5.4.8 RP (Reagent pump)

1. Explanation of function



Manual function (RP)

2. INIT	The washing side of pump : To move to the home position (the upper limit).	
3. PULL(1800uL)	The washing side of pump : Aspiration movement (1800uL)	
4. PUSH(1800uL)	The washing side of pump : Dispensation movement (1800uL)	
5. Move Speed	The washing side of pump : ★ Move pulse rate	
6. INIT	The reagent side of pump : To move to the home position (the upper limit).	
7. PULL(75uL)	The reagent side of pump : Aspiration movement (75uL)	
8. PUSH(75uL)	The reagent side of pump : Dispensation movement (75uL)	
9. Volume Set	The reagent side of pump : Setting of the amount of reagent for aspiration or dispensation.	

CW means Dispensation and CCW means Aspiration.

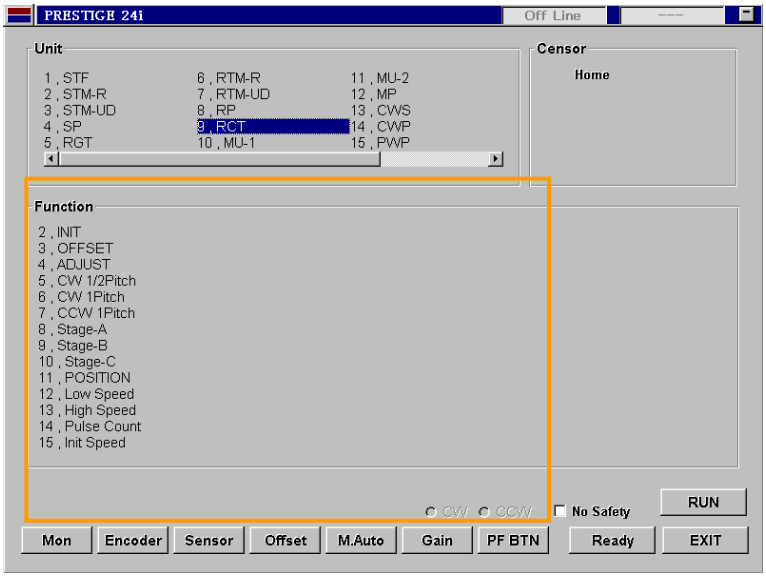
10. Move Speed	The reagent side of pump : ★ Move speed pulse rate	

★ shows that setting is not needed.

11. EV2-ON	Electromagnetic valve EV-2 ON	Line switch to the probe.
12. EV2-OFF	Electromagnetic valve EV-2 OFF	Line switch to the water tank.
13. EV3-ON	Electromagnetic valve EV-3 ON	Line switch to the R2 probe.
14. EV3-OFF	Electromagnetic valve EV-3 OFF	Line switch to the R1 probe.

5.4.9 RCT (Reaction tray)

1. Explanation of function



Manual function (RCT)

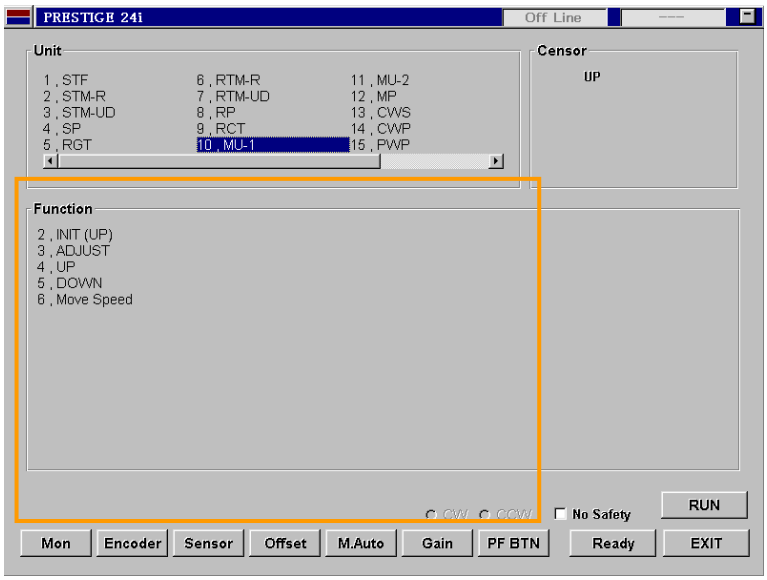
2. INIT — To move to the home position.
3. OFFSET — To move for the corrective value set in the offset screen.
4. ADJUST — To input the angle to move by value, and select the direction of rotation.

5. CW-1/2 Pitch — To move clockwise by 1/2 pitch.
6. CW-1 Pitch — To move clockwise by one pitch.
7. CCW-1 Pitch — To move counter-clockwise by one pitch.
8. Stage-A — To move counter-clockwise by 13 pitches.
9. Stage-B — To move counter-clockwise by 21 pitches.
10. Stage-C — To move counter-clockwise by 27 pitches.
11. POSITION
12. Low Speed — ★ Starting pulse rate
13. High Speed — ★ The highest speed pulse rate
14. Pulse Count — ★ Adjustable speed pulse count
15. Init Speed — ★ Pulse rate of initialization

★ shows that setting is needed.

5.4.10 MU-1 (Mixing unit-1)

1. Explanation of function



Manual function (MU-1)

2. INIT To move to the home position (Up position).

3. ADJUST To move for the corrective value set in the offset screen.

CW means Up, and CCW means Down.

4. UP Up (The same Up movement as the auto movement.)

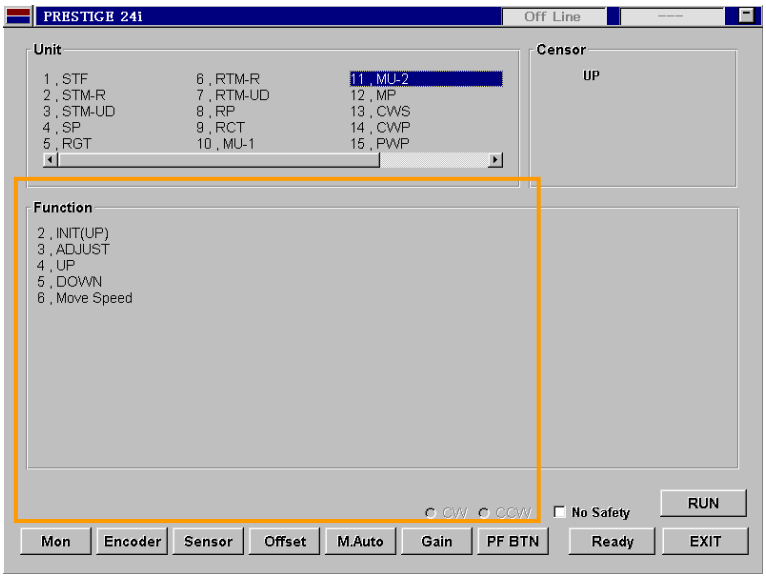
5. DOWN Down (The same Down movement as the auto movement.)

6. Move Speed ★ Move speed pulse rate

★ shows that setting is not needed.

5.4.11 MU-2 (Mixing unit-2)

1. Explanation of function



Manual function (MU-2)

2. INIT — To move to the home position (Up position).

3. ADJUST — To input the distance by the value and select the direction of movement.

CW means Up, and CCW means Down.

4. UP — Up (The same Up movement as the auto movement.)

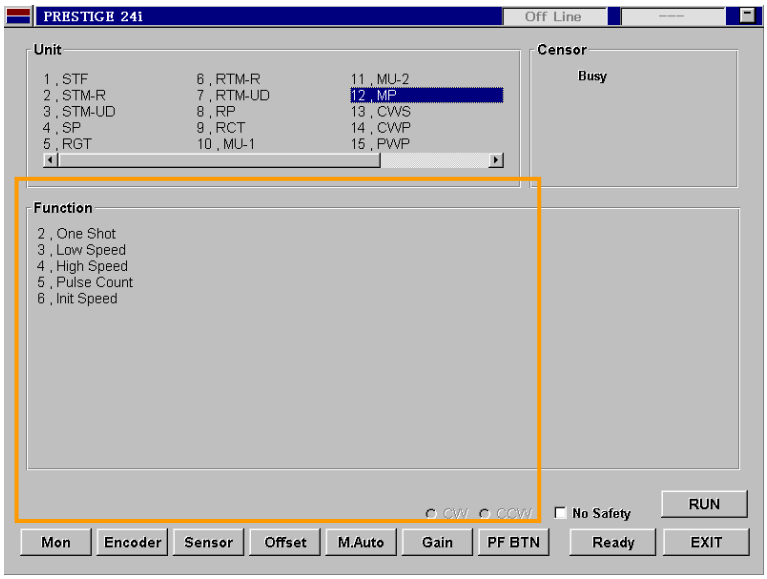
5. DOWN — Down (The same Down movement as the auto movement.)

6. Move Speed — ★ Move speed pulse rate

★ shows that setting is not needed.

5.4.12 MP (Mixing pump)

1. Explanation of function



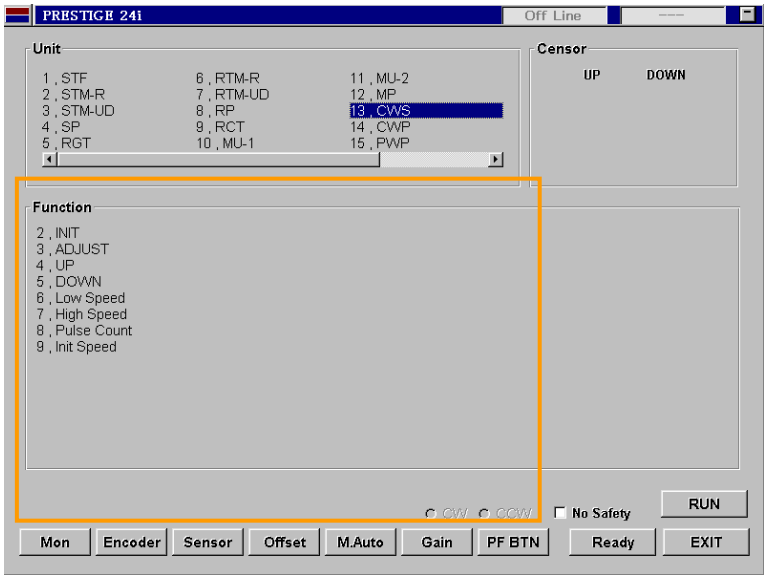
Manual function (MP)

2. One Shot	One rotation
3. Low Speed	★ Starting pulse rate
4. High Speed	★ The highest speed pulse rate
5. Pulse Count	★ Adjustable speed pulse count
6. Init Speed	★ Pulse rate of initialization

★ shows that setting is needed.

5.4.13 CWS (Reaction cuvette washing station)

1. Explanation of function



Manual function (CWS)

2. INIT — To move to the home position (Up position).

3. ADJUST — To input the distance by the value and select the direction of movement.

CW means Up, and CCW means Down.

4. UP — Up (The same Up movement as the auto movement.)

5. DOWN — Down (The same Down movement as the auto movement.)

6. Low Speed — ★ Starting pulse rate

7. High Speed — ★ The highest speed pulse rate

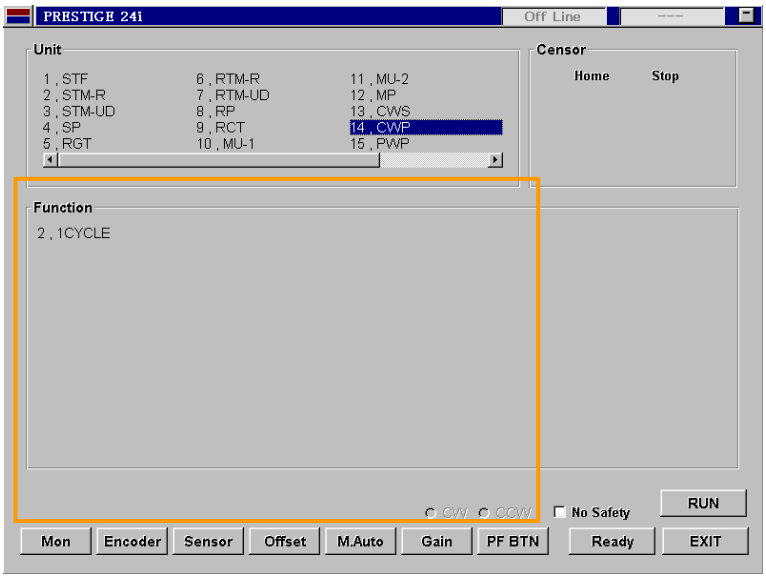
8. Pulse Count — ★ Adjustable speed pulse count

9. Init Speed — ★ Pulse rate of initialization

★ shows that setting is needed.

5.4.14 CWP (Reaction cuvette washing pump)

1. Explanation of function

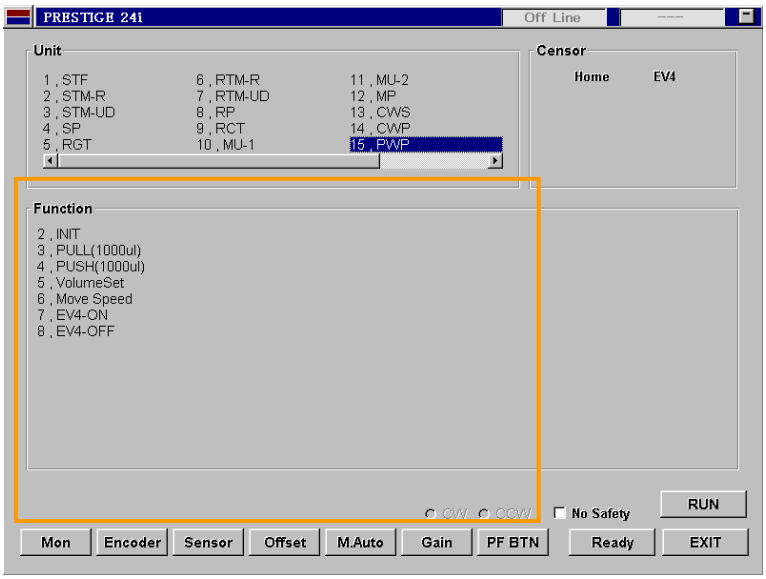


Manual function (CWP)

2. 1 Cycle One cycle (aspiration and dispensation) movement

5.4.15 PWP (Probe washing pump)

1. Explanation of function



Manual function (PWP)

2. INIT — To move to the home position (the upper limit).

3. PULL(1000uL) — Aspiration movement (1000uL)

4. PUSH(1000uL) — Dispensation movement (1000uL)

5. Volume Set — Setting of the amount of solution for aspiration / dispensation.

CW means Dispensation, and CCW means Aspiration.

6. Move Speed — ★ Move speed pulse rate

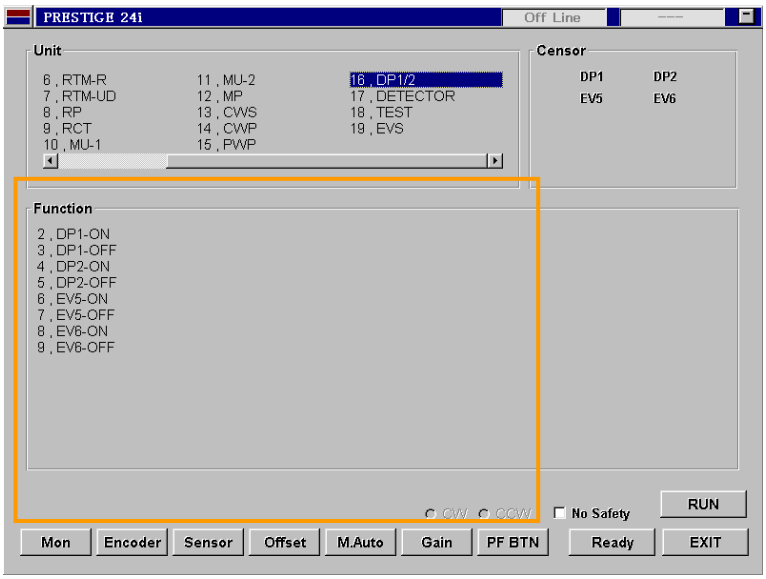
7. EV4-ON — Electromagnetic valve EV-4 ON — Line switch to the washing trough.

8. EV4-OFF — Electromagnetic valve EV-4 OFF — Line switch to the water tank.

★ shows that setting is not needed.

5.4.16 DP-1/2 (Drainage pump - 1, 2)

1. Explanation of function

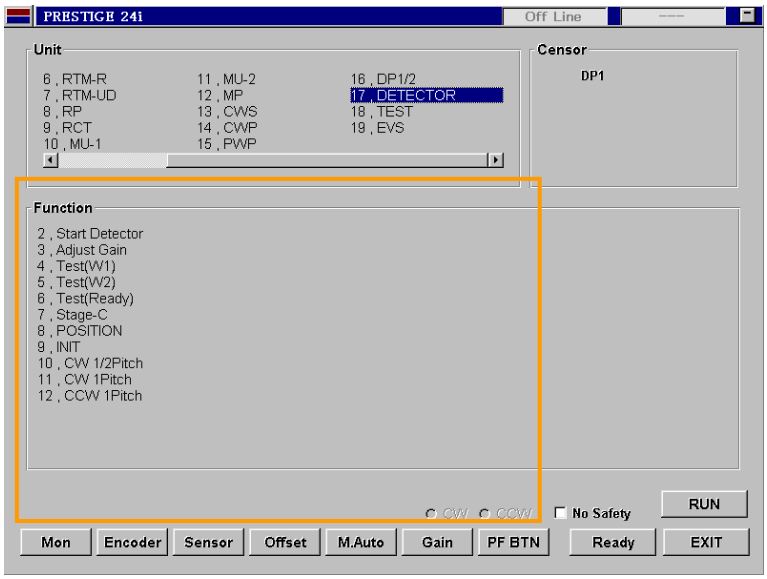


Manual function (DP-1/2)

2. DP1 ON	DP-1 movement ON
3. DP1-OFF	DP-1 movement OFF
4. DP2-ON	DP-2 movement ON
5. DP2-OFF	DP-2 movement OFF
6. EV5-ON	Electromagnetic valve EV-5 ON
7. EV5-OFF	Electromagnetic valve EV-5 OFF
8. EV6-ON	Electromagnetic valve EV-6 ON
9. EV6-OFF	Electromagnetic valve EV-6 OFF

5.4.17 DETECTOR (Colorimetry detector)

1. Explanation of function



Manual function (DETECTOR)

2. Start Detector	Not ready.
3. Adjust Gain	Not ready.
4. Test(W1)	Not ready.
5. Test(W2)	Not ready.
6. Test(Ready)	Not ready.
7. Stage-C	Not ready.
8. POSITION	Not ready.
9. INT	Not ready.
10. CW 1/2 Pitch	Not ready.
11. CW 1 Pitch	Not ready.
12. CCW 1 Pitch	Not ready.

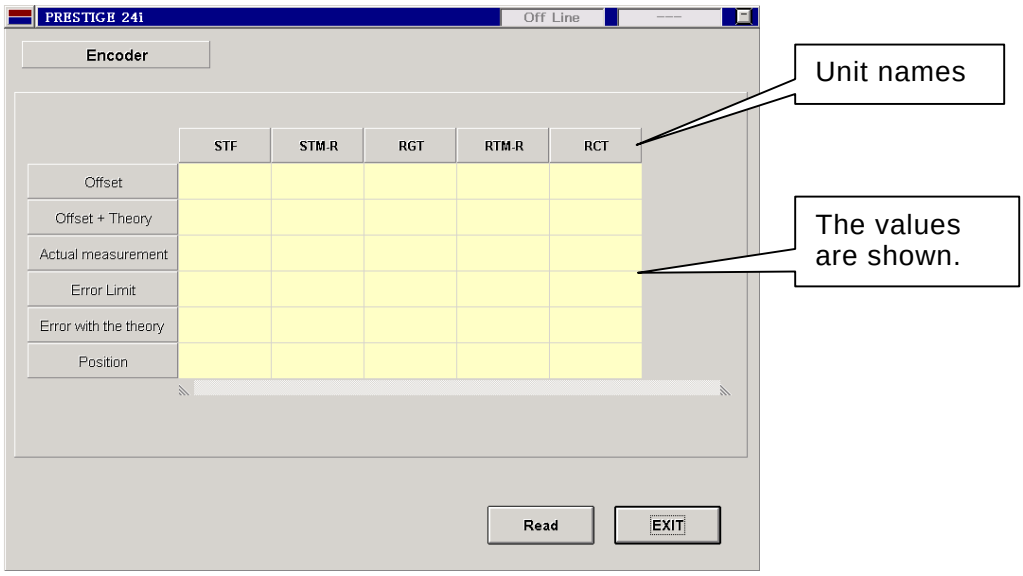
5.5 Manual function sub-screens

5.5.1 Encoder screen

1. Explanation of the screen

When clicking [Encoder] button in the bottom of the manual function screen, the following screen comes out.

This screen is used for checking of encoder.



Encoder screen

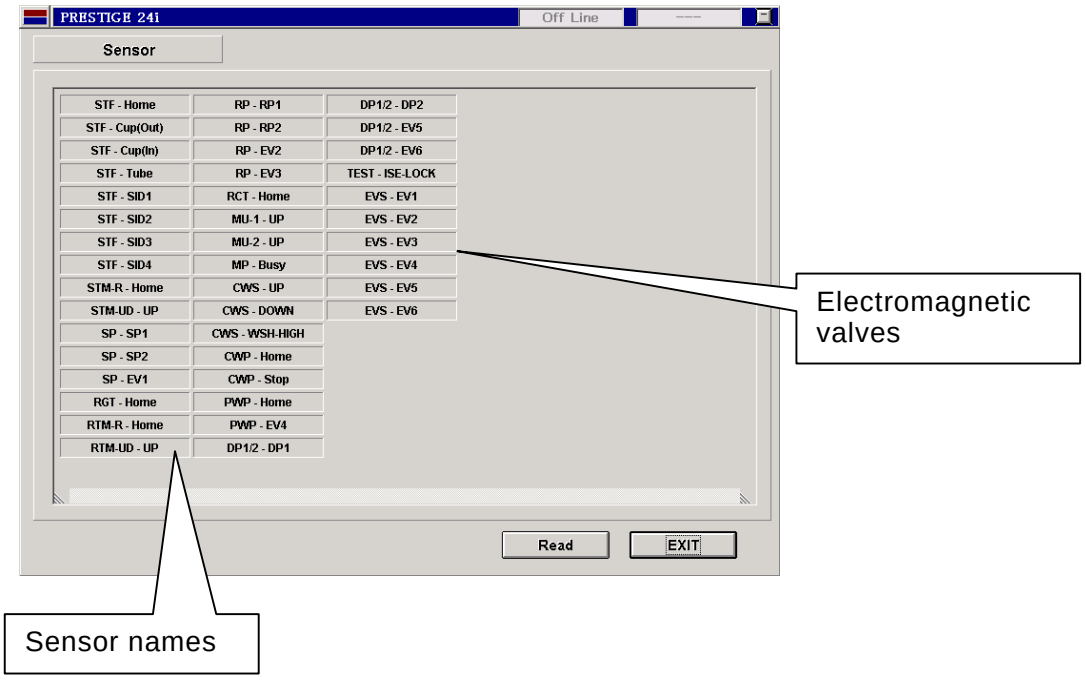
1. Offset	Not ready. (0 is shown.)
2. Offset+Theory	The theoretical value is shown.
3. Actual measurement	The actual measurement value is shown.
4. Error Limit	The limit is shown. If the measurement exceeds this value, it causes an error.
5. Error with the theory	The sum of the theoretical value and the limit value is shown.
6. Position	The position number at the time of clicking is shown.
7. Read	The values of the above mentioned 1-6 at the time of clicking are shown.
8. Exit	When clicking, the screen returns back to the manual function screen.

5.5.2 Sensor screen

1. Explanation of the screen

When clicking Sensor button in the bottom of the manual function screen, the following screen comes out.

This screen is used for checking of function of the sensor and electromagnetic valve.



1. Read — When clicking Read button, the state at the time of clicking is shown.
   In case of ON, the letters are shown in red.
   In case of OFF, the letters are shown in blue.

2. EXIT — When clicking EXIT button, the screen returns back to the manual function screen.

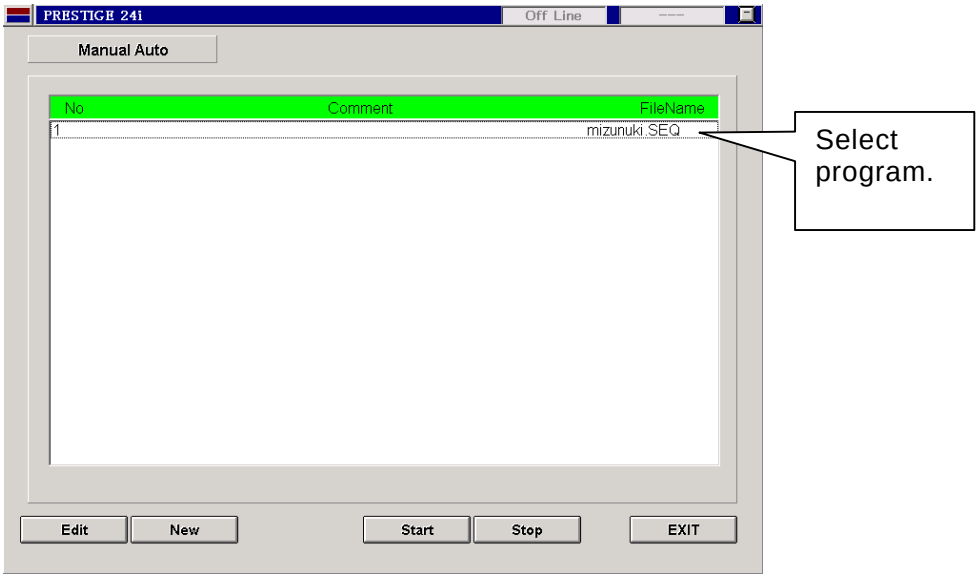
5.5.3 Manual Auto screen

1. Explanation of the screen

When clicking M.Auto button in the bottom of the manual function screen, the following screen is shown.

This screen is used for programming a series of combined movements of manual functions.

Notice
Programming is possible using this screen, but it might break the system if it is something amiss with the program. So, use only the program which is provided by the sales agency.



Manual Auto screen-1

1. Edit — It is used to change the program which was already made. When clicking, Manual Auto screen-2 is shown.

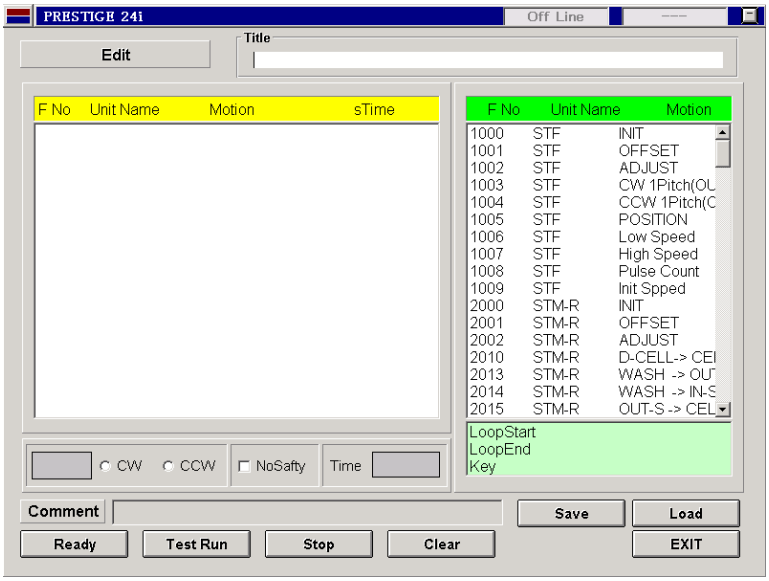
2. New — It is used to make a new program. When clicking, Manual Auto screen-2 is shown.

3. Start — The selected program is performed.

4. Stop — The program in action is stopped.

5. Exit — When clicking, the screen returns to the manual function screen.

When clicking [Edit] or [New] button in Manual Auto screen-1, the following screen is shown.



Manual Auto screen-2

It is possible to program combining the movements of units in this screen, but programming is not permitted except for the sales agency.
So, the explanation is omitted.

When clicking [Exit] button in this screen, the screen returns to Manual Auto screen-1.

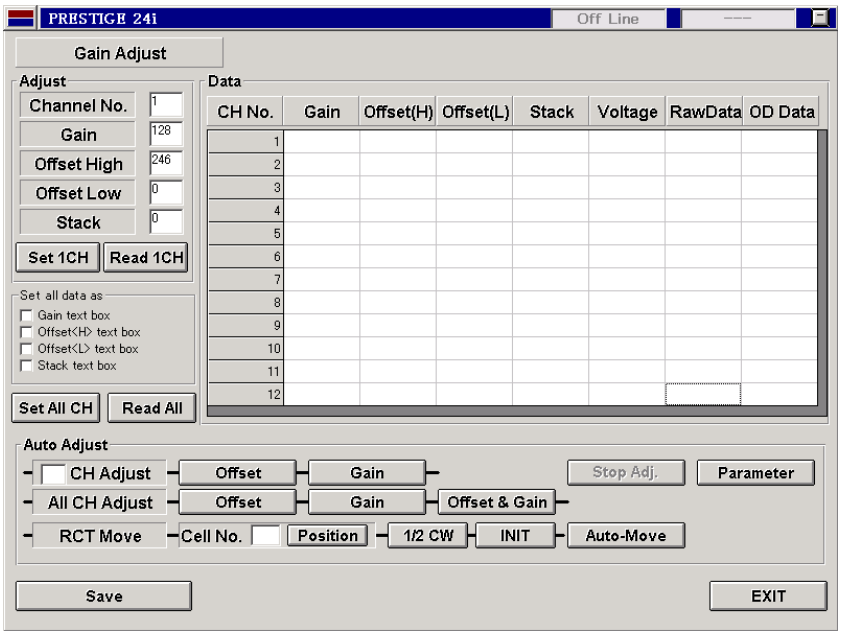
5.5.4 Gain screen

1. Explanation of the screen

When clicking [Gain] button in the bottom of the manual function screen, the following screen is shown.

This screen is used for adjusting the gain automatically when exchanging the lamps.

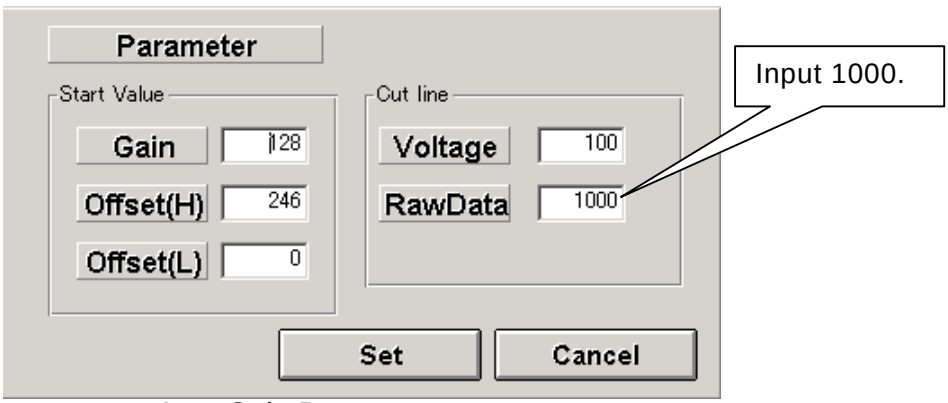
2. The procedure for adjusting the gain



1) Click [Read All] button and check that the values are displayed.

2) Click [Offset] button in the row of [All CH Adjust] to set Offset automatically.

3) Clicking [Parameter] button, the dialog box is shown.

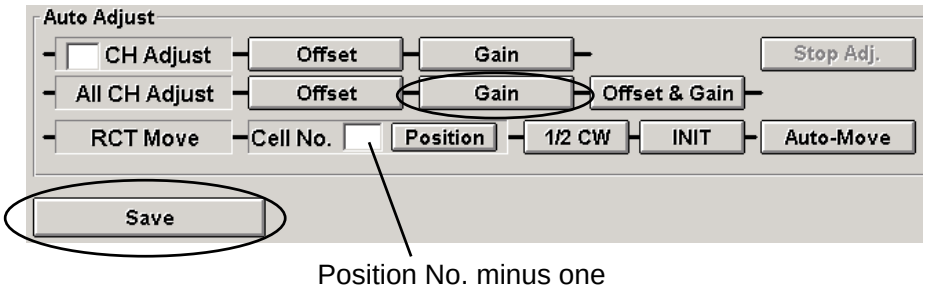


Auto Gain Parameter screen

4. Input 1000 in the blank of **Raw Data**, and click [Set] button.

Clicking [Set] or [Cancel] button, the dialog box is closed.

5. Move the reaction cuvette with ion exchange water in it on the optic axis in the following procedure.



- Click [INIT] button in the row of **RCT Move**.
- Input the number, which is the position number of the reaction cuvette with ion exchange water in it minus one, in the blank of Cell No. (For example, input 44 in case of the position number 45.)
- Click [Position] button in the row of **RCT Move**.
- Click [1/2 CW] button in the row of **RCT Move**.

6. Clicking [Gain] button in the row of **All CH Adjust**, the gain is automatically set.

7. Click [Save] button to save the setting.

8. Move the reaction cuvette with ion exchange water in it to the original position as follows.
   - Click [INIT] button in the row of **RCT Move**.
   - The reaction cuvette with ion exchange water in it goes back to the position originally set.

9. Take out the reaction cuvette with ion exchange water in it, and set the original reaction cuvette.

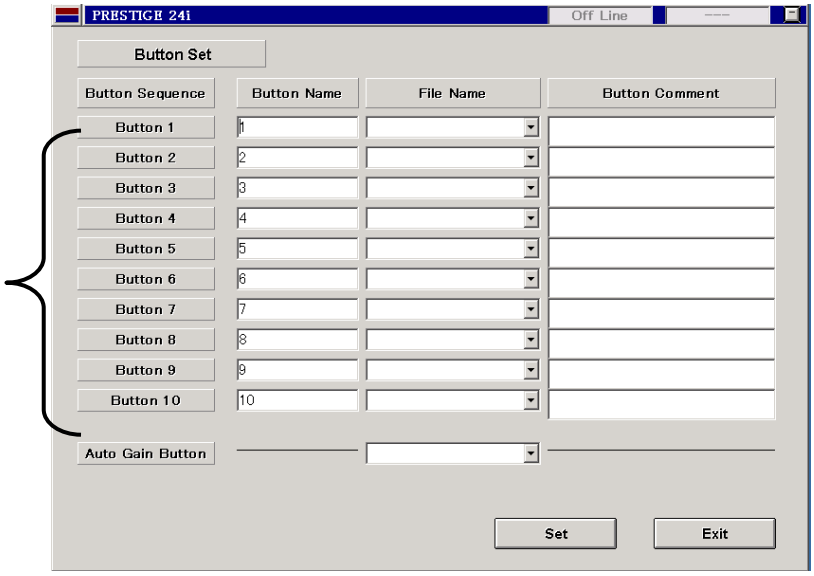
10. Go back to the manual function screen by clicking [Exit] button.

5.5.5 PF BTN screen

1. Explanation of the screen

Clicking [PF BTN] button in the bottom of the manual function screen, the following screen is shown.

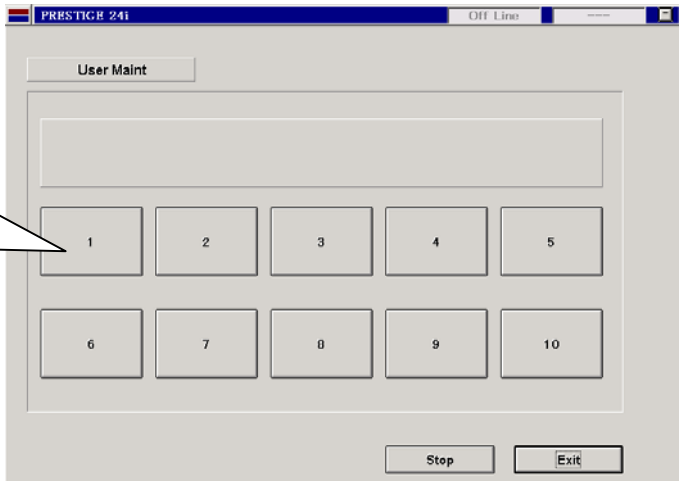
This screen is used to set the program that is made in Manual Auto screen onto the user maintenance screen.



PF BTN screen

1. Button Name	Register the names. (But the names are not necessary.)
2. File Name	Select a program in the list box.
3. Button comment	Input the comments. (But the comments are not necessary.)
4. Set	The program set in the user maintenance screen is registered by clicking [Set] button.
5. Exit	Clicking [Exit] button, the screen goes back to the manual function screen.
6. Auto Gain Button	Not ready

These numbers correspond with in the user maint. screen.



User maintenance screen

说明：以上部分为 1024I 的试剂瓶图示。由于没有 1024I 的单试剂瓶样品，所以用双试剂瓶的图形来说明单试剂瓶的大小和形状。即单试剂瓶的外形等同于双试剂的第一试剂和第二试剂瓶和起来的外形，但是瓶口在第一试剂瓶的开口处。

另外，1024 的试剂瓶按照提供的样品制作即可。